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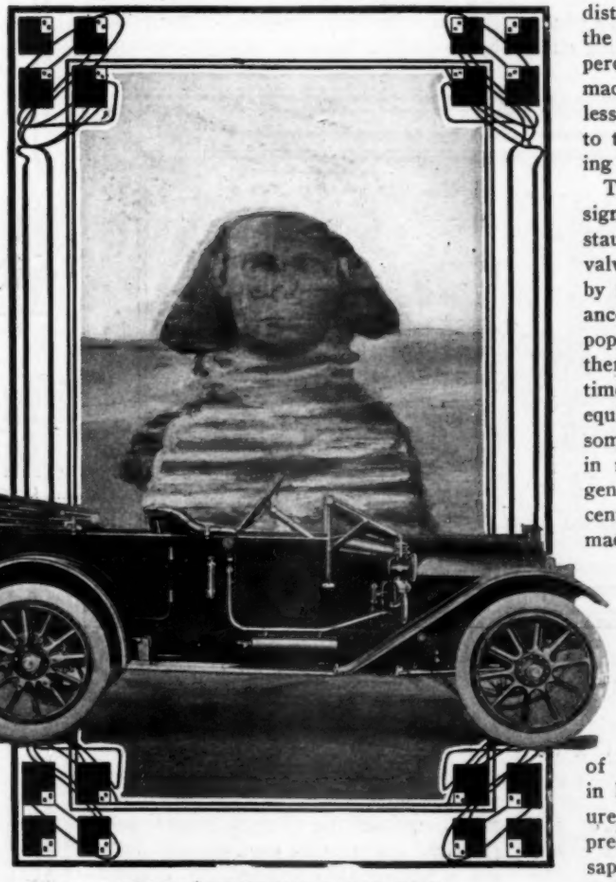
THE AUTOMOBILE

What Motor Inventors Are Doing

Quest for Silence in Devious Ways

Following the introduction of the Knight type of sleeve motor in America there are many indications of activity along more or less similar lines, and inventors are taking advantage of the rotary principle of valve mechanisms to some extent and to sliding valves in various forms, and the illustrations here afforded are contributed by one school of design in the quest for silence and efficiency.



IN THE COMPETITION FOR SILENCE

WHEN the sleeve type of motor was first presented to the notice of the builders of automobiles it fell upon deaf ears. It was not then supposed that a machine could be built so that it would perform silently, and in all fairness noise was courted on the ground that it was a good indication of a vigorous power plant. As time settled upon the ability of power plants in general, and it was learned that noise was not necessarily an indication of power—in fine, when efficiency became a factor in the enterprise and the twins of merit were looked upon as the progeny of silence and efficiency—the desire to get away from the causes of noise and power losses took root in the thoughts of designers; the automobile industry has so far progressed that the supporters of the industry are putting a premium on silence, and it would be difficult to disabuse them of the idea that where silence reigns efficiency is absent.

It would be difficult to state how many of the makers of automobiles of to-day are working upon the various types of motors that do not depend upon poppet valves for their performance. Moreover, it may be truly stated that every maker of cars who puts faith in poppet valve mechanisms is re-designing the parts on a basis of silence as the prime consideration, and it is doubtless true that when the valves do their work noiselessly they function efficiently also. It is more than likely that the best testing instrument available to the mechanician may be known by the appellation of "kinetic silence," the attempt being made here to distinguish between the static and the kinetic condition, with the hope, perchance, that the silence of the machine as it rests in its motionless static state will be transferred to the time when the motor is doing kinetic work.

There are many schools of design in motor building, and the staunch advocates of the poppet valve type of motor are proving by their work that silent performance is no stranger to a well-made poppet valve type of motor, nor is there any indication at the present time that these sturdy power equipments are to be supplanted by something new. It has been said in recounting business ventures in general that upwards of 94 per cent. of all the efforts that are made end in failure, and that a sparse 6 per cent. of industrial activity ends in success. Of the many undertakings in the motor field that have for their foundation the building of something new, it is not too much to expect that the customary percentage of the whole effort will go down in history on the carry-all of failure, and it is the purpose in this presentation to save time and the sap of investment by telling the various designers of the efforts that are being made in this field, avoiding, in so far as it is possible to do so, the praising of individual undertakings until it can be shown by actual trial that they will survive the "acid" test.

How the Various Designers Approach the Difficult Problem of Motor Building

Before passing on to the discussion of the types of motors that differ in principle from the Knight design, it is proposed to show by illustration and reference the modifications of this idea as they

obtain in Continental makes of motors, and Fig. B is an elevation in part section of the Panhard-Knight motor as made by Panhard & Levassor, Paris. In this elevation, which is of the left-hand side of the motor, the front cylinder is given in section, showing the main bearings M1, M2, and part of the middle main bearing M3, the latter being provided with means for taking the thrust imposed upon the crankshaft. The connecting rod C1 has a liberal size of large end bearing M4, and the piston H has three rings h above the gudgeon pin. Attention is called to the inverted sphere-like head of the piston, and the fact that one of the piston rings h is in the body of metal forming the wall of the piston above the plane of the inverted sphere-like head. Among other possibilities it is more than likely that the designer of this motor figured upon the insulating quality of a layer of dead gas in the cup formed in the piston head, but this depression is also indicated by the necessities of a proper compression ratio dictated by the fact that the cylinder head inserts into the cylinder and a considerable amount of the diametral space is occupied by the walls of the head, accommodating a junk ring e, not forgetting that the sleeves are in the concentric relation with the cylinder, also the piston, and the part of the head that extends down into the cylinder, so that the compression space E formed in the head would scarcely suffice in view of the requirement, and it therefore follows that the depression of the piston head offers the advantage of regulating the compression ratio without the necessity of exposing the walls of the sleeves to the flame during the period of combustion. We do not call to mind that anyone has heretofore pointed out that the sleeves of the Knight motor are protected from the fierce glare of the flame during the period of combustion. In this particular design of motor a single spark plug is inserted in the axis of the head, but the provision for cooling in the region of the spark plug is on a liberal basis.

The eccentric shaft L takes its power from the crankshaft through the pinion G by means of a silent chain to the gear K. The sleeves N and N′ have motion imparted to them through the connecting rods M and M′. The shrouded pulley V on the end of the crankshaft takes a belt for use in driving the air propeller. The crankshaft is flanged at the rear end and the main bearing M5 is of unusual length and has a liberal projected area.

Referring to Fig. C of the Panhard-Knight motor, the contour of the inlet and exhaust ports is sweeping and smooth, terminating in symmetrical lips of the inlet and exhaust ports, and when the piston H is on the top dwell point, the space between the shell of the piston head and the inmost point of the cylinder head is barely sufficient to uncover the slots in the sleeves, and the packing rings n_1 and n_2 on the inlet side, co-operating with the slots in the region of the exhaust port, imprison the mixture under compression within right confines, and leakage is substantially avoided. In examining this section of the cylinder in the region of the lips of the ports we do not find the same careful attempt to maintain cool conditions as is shown in some of the other examples of this same make of motor, although the excess of metal forming the lips of the ports is in close relation to the water in the jacket, the difference being due to the extension of the lips for an unwatered distance, and the bunching of metal, due to fillets, that must obtain under foundry conditions in a design so made. The carbureter is located on the right side of the motor and the intake I1 is of somewhat symmetrical

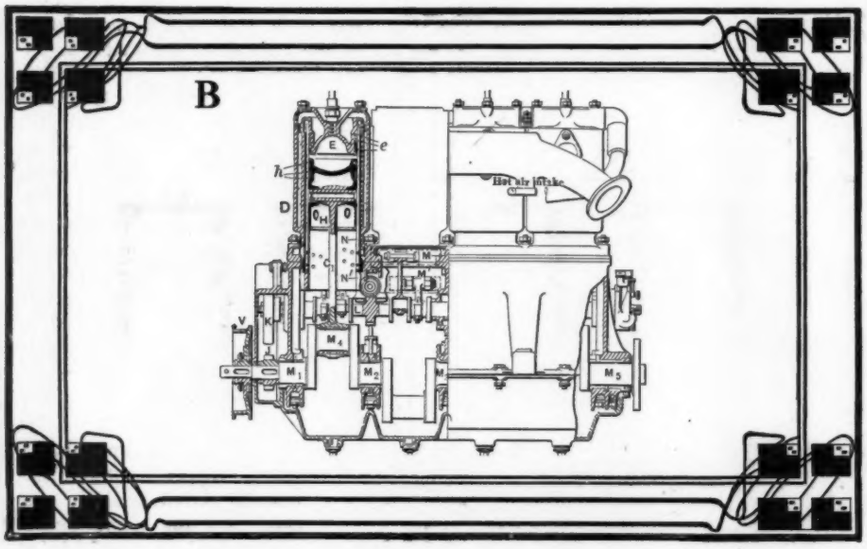


Fig. B—Sectional view of the Panhard-Knight motor, showing the relation of the sleeves, the spherical piston, and the method of operating sleeves

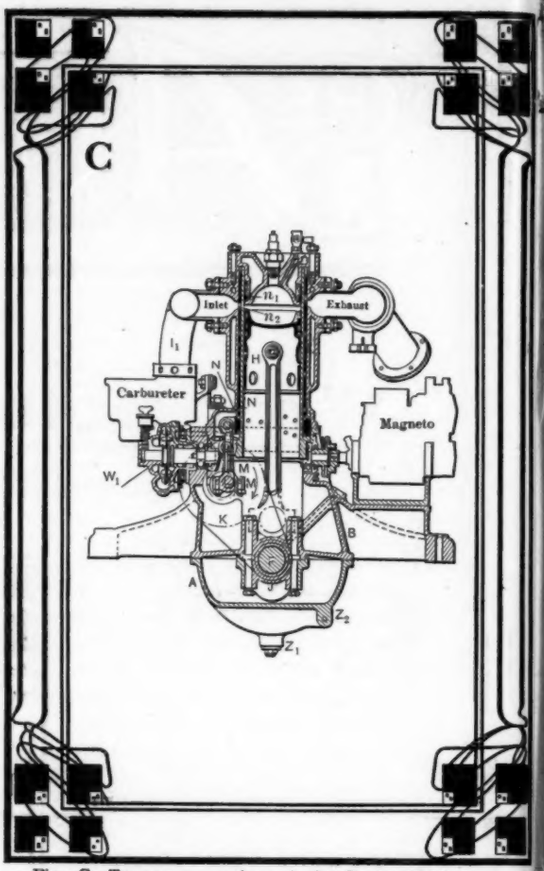


Fig. C—Transverse section of the Panhard-Knight motor, showing the small connecting rods that operate the sleeves and the cup-shaped piston

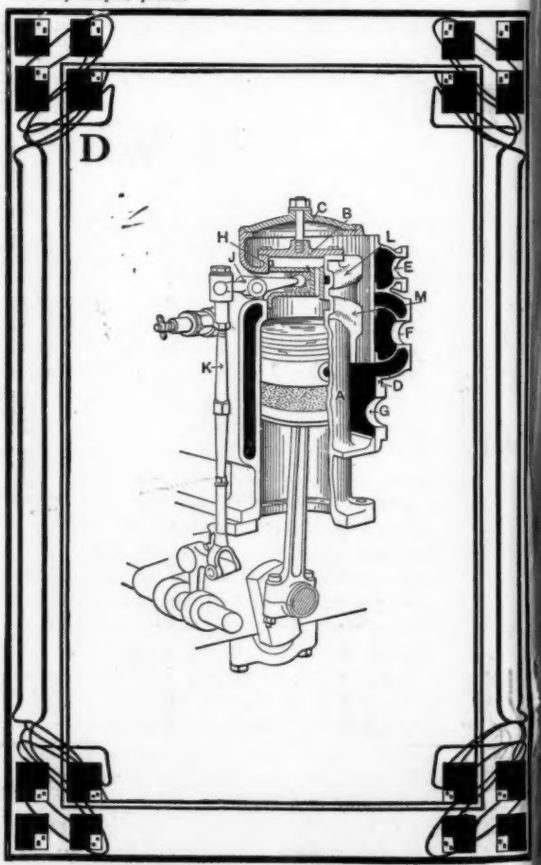


Fig. D—Showing the Reno Bois motor with part of the water jacket removed, together with the valve operating mechanism.

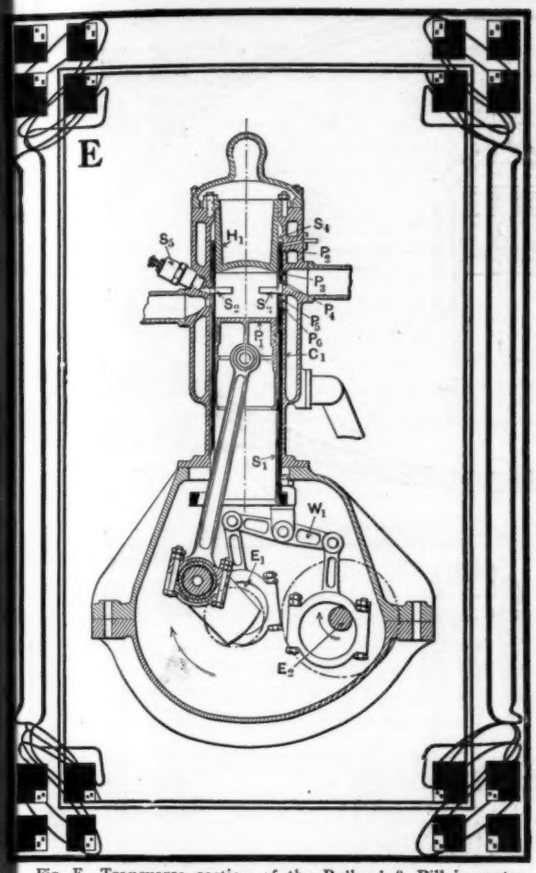


Fig. E—Transverse section of the Rolland & Pillain motor, showing the method of operating the single sleeve and the location of the spark plugs

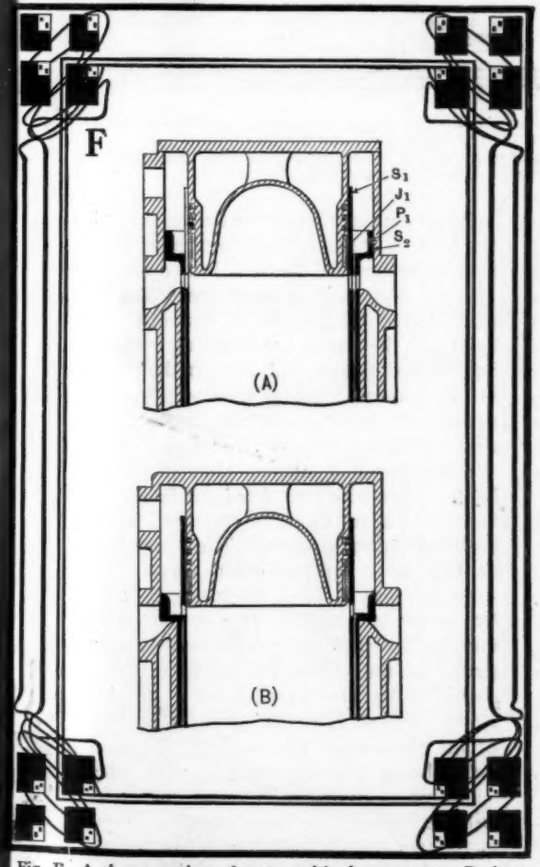


Fig. F—A shows section of motor with sleeves open. B shows position of outer sleeve when valves are closed

design, with an upward trend for a material distance before it branches out through the distributing arms to the respective cylinders. The magneto is on the opposite side of the motor, taking its drive from a cross shaft, the latter being driven through the good office of a spiral gear located between the first and the second cylinders on the eccentric shaft.

The water pump W1 is shown in section on the right hand side of the motor and is driven by an extension of the cross shaft in the plane of the magneto drive; an Oldham joint is placed in the length of this shaft at the approach of the water pump. Referring to the joint in the shaft as it extends to the magneto, it is of the dog type, and the magneto resting on a ledge extending out from the crankcase may be unbolted and removed at will without having to undo the joint, thus making for easy examination and repair.

faced or channeled cam carried on a camshaft parallel with the crankshaft.

To allow the rocking lever J to pass into the cylinder a slot is provided in the latter, which is always covered by an extension of the ring valves whatever the valve position. The split ring valve in its travel moves over the annular chambers L and M, which are cast in the cylinder wall and form the inlet and exhaust ports respectively, these ports being in communication with the inlet or exhaust trunks E and F.

The diagrams (a) (b) (c) and (d) in Fig. G show the valve in the induction, compression, firing and exhaust positions, the inlet port E (Fig. D) and the exhaust port F being shown uncovered during the induction and exhaust strokes, and both covered during the compression and working strokes. A (Fig. D) is the cylinder casting with a detachable head B, the central bolt of which holds the water jacket cover C. The side plate D carries

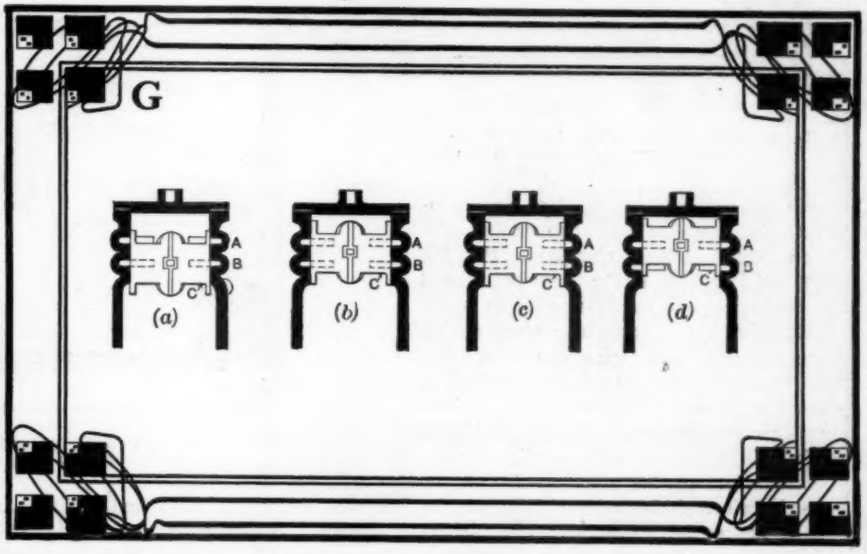


Fig. G—Section of the Reno slide valve engine showing induction, compression, firing and exhaust strokes respectively

How the Reno Bois Place the Sleeves in the Cylinder Head

Fig. D, which is a part section through the cylinder of the Reno motor, is a clear presentation of the idea instilled in this design, showing the crankshaft in the crankcase in the customary way and the connecting rod joining the crankpin to the piston through the gudgeon in the regular way, the valve mechanism being placed in the cylinder head, which by letter reference is described thus: The valve gear consists of a split ring H fitting closely in the cylinder head and provided with a bearing block which is engaged by the rocking lever J, which in turn is operated by the tappet K. This tappet is raised and lowered by means of a short bell crank, one leg of which engages the tappet, and the other a double-

the inlet union and chest E, and the exhaust trunk and union F, also the water connection G. The report of the performance of a motor of this design with a bore of 85 millimeters and a stroke of 130 millimeters states that the motor delivers 28 horsepower at 1,350 revolutions per minute, and it has been stated that this is the speed of greatest stability, although the motor accelerated during the test up to 2,200 revolutions per minute.

Rolland & Pillain Single-Sleeve Motor

A motor that performed favorably under racing conditions in France within the last two or three months, the Rolland & Pillain, is shown in Fig. E with the sleeve S1 concentrically related to the cylinder C1 and the piston P1 with slots S2 and S3 in the sleeve and a depressed head H1, leaving a space S4 between the

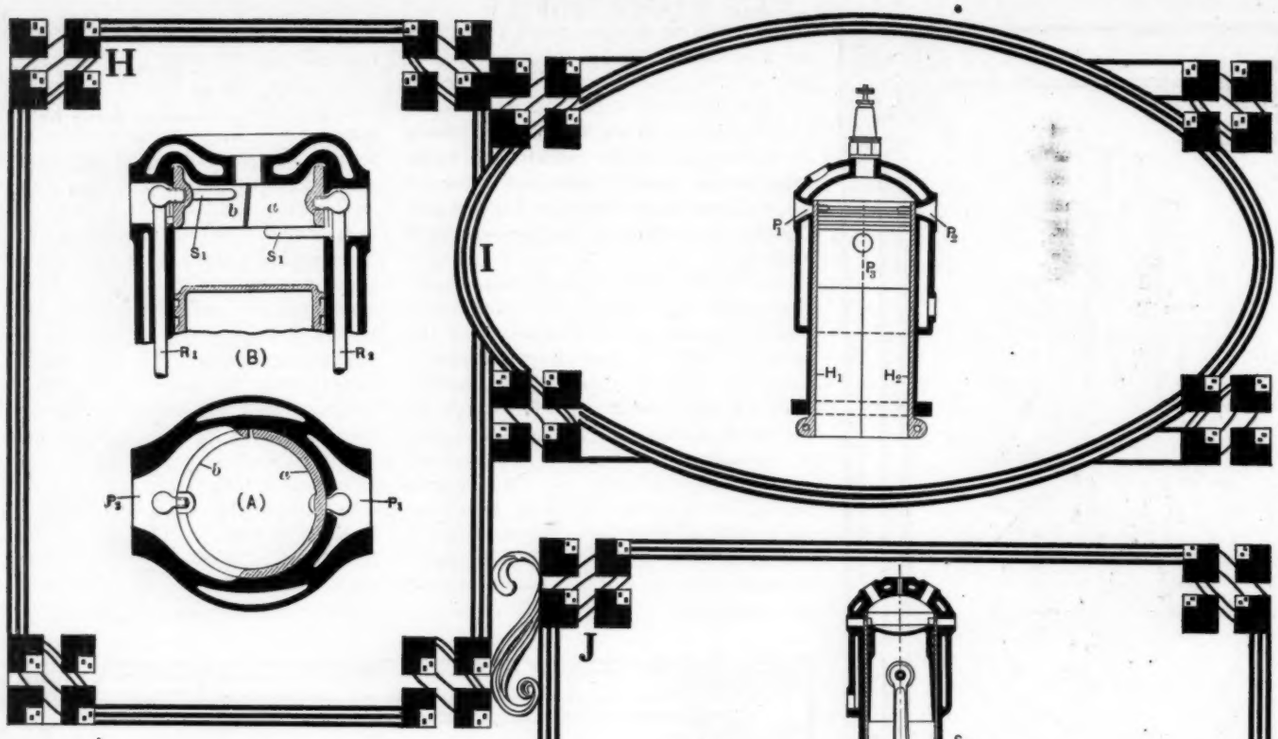


Fig. H—Sectional view of the Howard sliding sleeve valve motor utilizing a spherical split ring

Fig. I—Transverse sectional view of the Redrup motor in which two hemispherical sleeves cover and uncover the valve ports

Fig. J—Transverse section of the Mustard motor, showing how the two hemispherical sleeves are operated by means of cams and rollers

cylinder wall and the head to accommodate the sleeve in its reciprocating relation, with packing rings P2, P3, P4, P5 and P6, in the sleeve to maintain good compression, and the spark plug S5 so located that firing must take place during the period of uncovering due to the slot in the sleeve, shutting off the spark when the port closes. The sleeve S1 is given reciprocating motion by the walking beam W1, which is actuated through a combined effort of the eccentric E1 on the crankshaft and the eccentric E2 on the halftime eccentric shaft. The water-jacketing of the motor has been done with care, and the general design shows the earmarks of a motor engineer.

Knight Makes Modification of His Main Type of Motor

In *Der Motorwagen* of November 30, 1910, there was a description of the modified forms of sleeves as shown in Fig. S at A and B. Referring to A, the junk ring J1 aided by the three rings above are placed to maintain the tight relation of the long sleeve S1. The short sleeve S2 is so fashioned as to press against the outer wall in the cylinder head above the ports and a packing ring P1 is placed in the enlarged diameter of the ring to prevent the leakage of compression. In B, Fig. F, the outer ring is in the down position covering the ports.

Showing the Construction of the Howard Motor

In the Howard motor, which is given in sections A and B, Fig. H, the crankshaft, connecting rods and pistons conform to the conventions. The valve mechanism is composed of horseshoe-like members a and b in the head above the piston on the top of the stroke, with slots S1 and S2, which are covered and uncovered according to the four-cycle principle, and a reciprocating motion that is required for the purpose is imparted to the covers by means of the rods R1 and R2, as shown in the section B.

Referring to the section A through the cylinder and valve covers, the cover a is over the port P1, but the cover d is in the position of "open," permitting the flow of gas from the port P2. A further examination of this type of valve mechanism places it in the class with the Reno motor, and the sliding members forming the valves are held to their seats by pressure.

Referring to the Redrup Type of Sleeve Motor

Fig. I is a section through a cylinder of the Redrup type of sleeve motor showing a single sleeve between the piston and the bore of the cylinder, the main difference being that the sleeve is in two halves H1 and H2, split through the diameter as indicated by the line a, and the two halves of the sleeve are given reciprocating motion to cover and uncover the ports in the four-cycle timing relation. In the patent specifications of this motor the sleeve members are described as follows: "Consisting of a tapered sleeve split in halves lengthwise and fitted inside a cylinder which has one end closed to form the combustion chamber. The slides are at the inner end of their travel (as shown) so as to cover the ports B1 and B2; the slides would remain in this position during the compression and power stroke of the piston P3, which reciprocates within the parallel bore of the sleeves H1 and H2. Owing to the outside of the sleeves and the inside of the cylinder being slightly tapered, when the slides are in the position shown, pressure will be exerted on their meeting faces along two diametrically opposite division lines, thus making these two joints tight,

and also making a tight joint by each sleeve over the two ports, and also between the sides of the slides and the piston. The inner ends of the slides are their thin ends, and the outer ends are the thick ends, while the bore of the cylinder is smaller at the inner end and larger at the outer end." The invention provides for the linking up of the slides in any suitable way.

O. Mustard Comes Out with a Modification of the Idea Described in Fig. J

During the last Paris Salon interest was taken in the design of motor as shown in Fig. J, which is a section through the same, presenting a sleeve S1 in the bore of the cylinder accommodating the piston, the sleeve being in two halves a and b, split longitudinally. Motion is imparted independently to the respective halves of the sleeve to give the four-cycle timing. This sleeve motion is induced by cams C1 and C2 on opposite sides of the crankshaft and is interpreted by rollers R1 and R2 through a bell crank B1 and B2, thence to linkages L1 and L2. The camshafts are in the halftime relation with the crankshaft.

W. W. Moore Resorts to the Use of a Single Sleeve

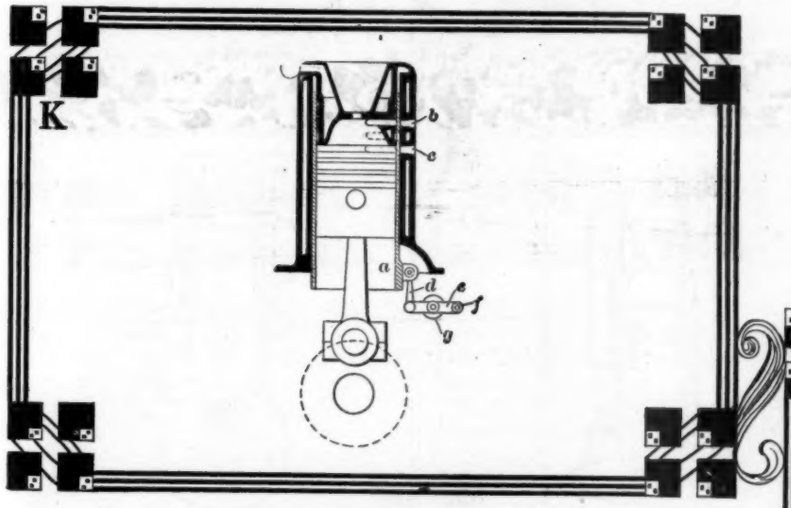
Referring to Fig. K, showing a cross-section of a cylinder of a motor, the single sleeve A is in the concentric relation with the piston in the bore of the cylinder, and the ports b and c are uncovered according to the four-cycle principle of timing, reciprocating motion being given to the sleeve through the links d interpreted by the lever e with a fulcrum at f and a cam motion g. In other respects this type of motor conforms to the main idea of sleeve design.

Chalmers Takes Kindly to the Two-Sleeve Idea

Fig. Q presents a Chalmers motor of the double-sleeve type in part section, the sleeves being of different lengths with a long sleeve L1 within and a short sleeve S1 between the long sleeve and the bore of the cylinder B1. Motion is imparted to the sleeves through the link L2 for the long sleeve, and the link L3 for the short sleeve from an eccentric E1, taking rotary motion from the crankshaft S2, the speed of the eccentric being half of the speed of the crankshaft. A is the inlet port and B2 is the exhaust port. The invention has been described as consisting in supplying air under pressure for scavenging and adding to the inlet charge. The air is admitted into the crank chamber by the passage C1 and compressed on the down stroke of the piston. The compressed air then finds its way by the passage D1 through the port E2 which at the right time registers with the port F1. In this way the air compressed in the crank chamber is allowed to enter the cylinder twice during each cycle. This occurs at the end of the suction stroke after the inlet valve is closed. Thus the gas in the cylinder is added to by the amount of compressed charge supplied, and to compensate for the dilution the gas taken through the inlet port A is richer than usual. On the exhaust stroke fresh air is again admitted under pressure. In this case it affects the scavenging action.

D'Orsay McCall White Type of Motor

This motor is of the double-sleeve type, but instead of placing the sleeves within the bore of the cylinder in the concentric relation with the piston, they are placed between the outer wall of the water jacket and a protecting exterior sheath. The sleeve S1 is given reciprocating motion through the connecting rod C1, assisted by a guide G1, and the sleeve S2



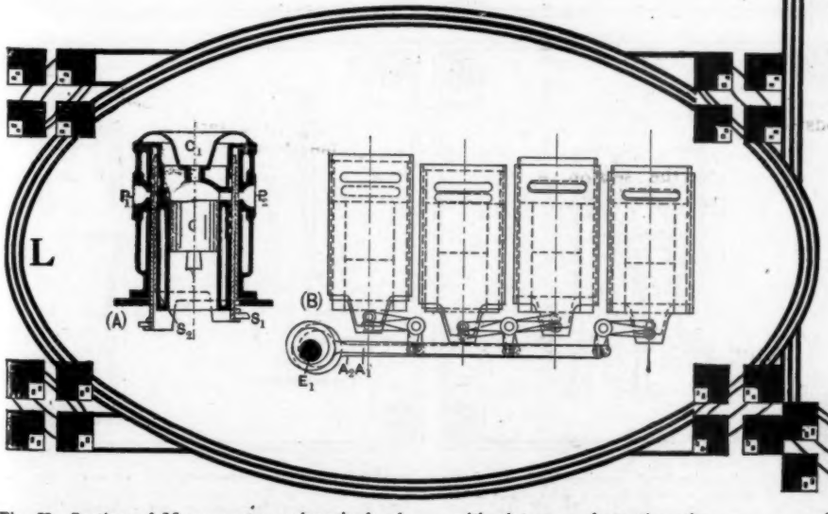


Fig. K—Section of Moore motor, using single sleeve, with slots one above the other
Fig. L—A, sectional view of the Riley sleeve motor. B, valve operating mechanism of the motor showing the relation of the ports in the sleeves

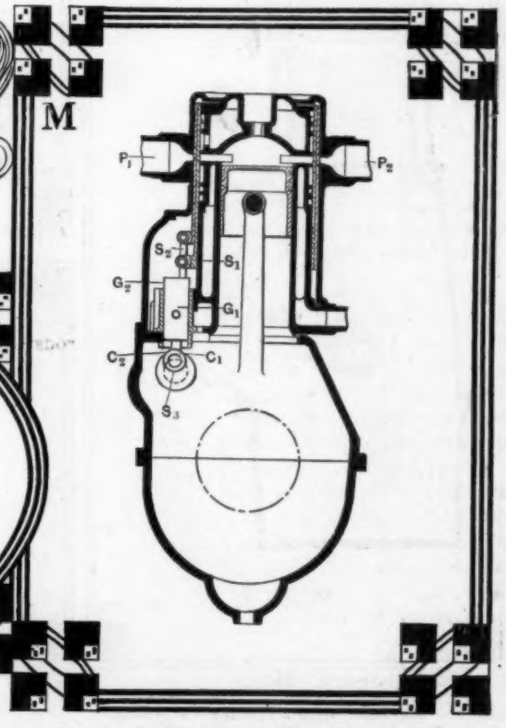


Fig. M—Section of the D'Orsay McCall White Motor, showing the stationary valve guide situated inside and endwise-movable tubular distribution valve

is reciprocated by the connecting rod C2 through a companion guide G2. The connecting rods have motion imparted to them by eccentrics on the shaft S3. This shaft is driven through a train of gears by the crankshaft in the usual way. Gas is admitted through the port P1 and exhaust is out of the port P2. The slots in the sleeves register in a manner conforming to the four-cycle relations and leakage by the sleeves is prevented by rings in grooves suitably disposed in the exterior walls of the water jacket, assuring tightness under all conditions.

Lanchester Motor of the Two-Sleeve Type

Referring to Fig. N. of the Lanchester motor with two sleeves S1 adjacent to the piston in the concentric relation and S2 between S1 and the cylinder C1. The mode of operation imparting reciprocating motion to the sleeves is through a connecting rod C2 for the inner sleeve and another connecting rod C3 for the outer sleeve.

Reciprocating motion is imparted to the inner sleeve S1 through the connecting rod C2 by the eccentric E1 on the shaft S3, and motion is imparted to the sleeve S2 through the connecting rod C3 by the eccentric E2 on the shaft S4. The ports P1 and P2 are covered and uncovered according to the four-stroke cycle principle. The cylinder head H1 is water jacketed and it is inserted into the bore of the cylinder which terminates in a spherical dome.

The shaft S4 by which the outer sleeve is driven, is mounted coaxialy with the cylinder container, or may be arranged independently, so that the position of the shaft and the motion of the outer sleeve are unaffected by movements of the lever L1. The shaft S3 on the other hand receives motion of two kinds when the lever L2 is operated; it is displaced bodily parallel to itself in such a manner that the duration of the period during which the inner sleeve ports are uncovered with respect to the cylinder head is varied, the timing of mean position of the dead center being substantially unaffected by this component of the motion, but it receives a rotary motion due to the epicyclic action of the gears whereby the timing of mean position of the sleeve is also caused to vary.

McIntosh Sleeve Type of Motor Has an Overhead Mechanism

Referring to Figs. O and P of sections through one of the cylinders in two planes, the sleeves are given reciprocating motion from an eccentric shaft E1 mounted on the top of the cylinder through links L1 for the sleeve S1 and L2 for the sleeve S2. According to British patent specifications 28,061, this motor is of the four-cycle type with the two reciprocating cylindrical valve-sleeves arranged concentrically with the working cylinder. Power is transmitted to the operating mechanism from the main shaft through an enclosed skew and a vertical spindle to a lay or second shaft situated along the center of the cylinder head. The arrangement of the cranks, and valve-ports, upon the sleeves, and the movements of the sleeves, for the opening and closing of the valve-ports, is stated to be similar to present practice in the Knight type of motor. The shaft E1 carries upon it at a position at each end of each cylinder a pair of these cranks or eccentrics from which power is transmitted to the valve-sleeves.

Riley Imparts Motion to the Sleeves in an Ingenious Way

Referring to Fig. L, the section (A) through a cylinder of a motor shows the pair of sleeves S1 and S2 within the bore of the cylinder in the concentric relation with the piston with an inserted cylinder

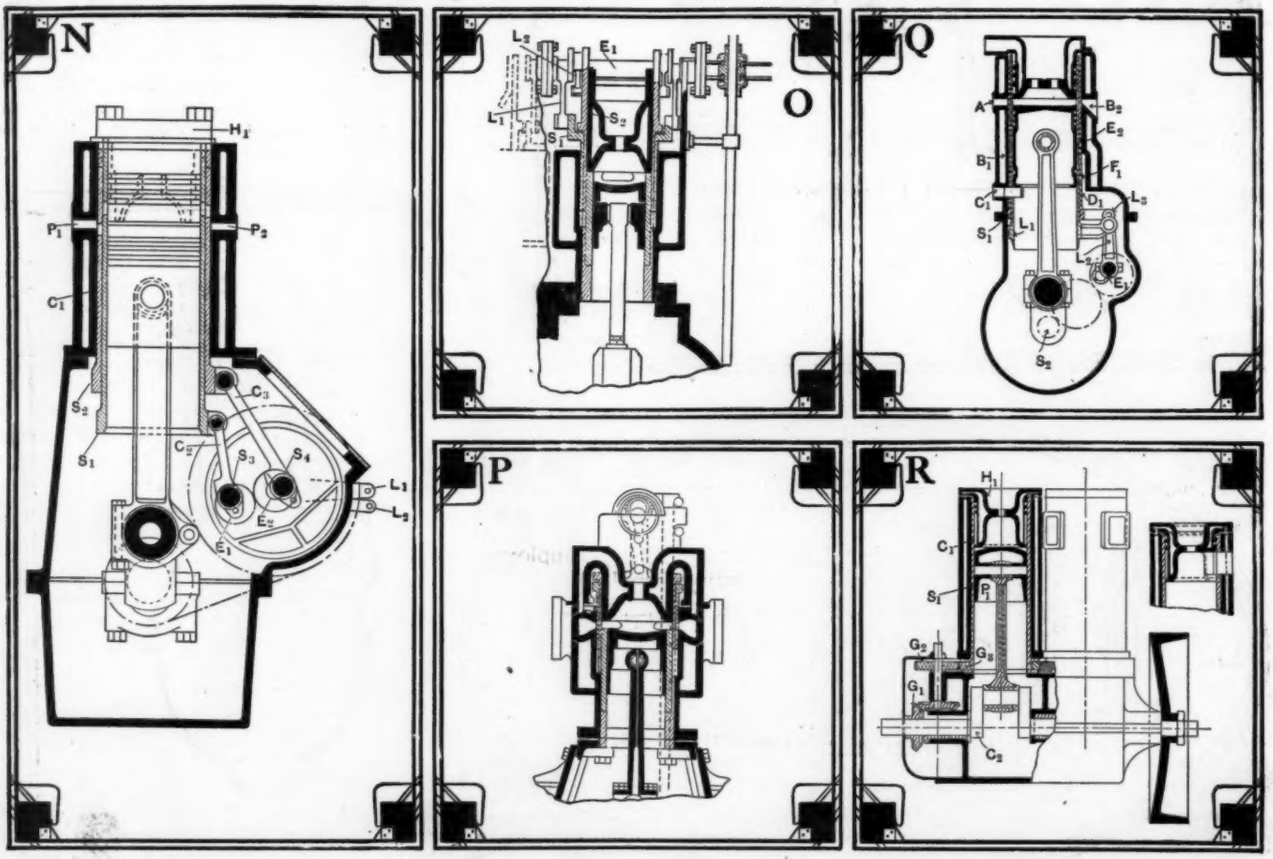


Fig. N—Sectional view of the Lanchester double sleeve valve motor, showing the method of operating the sleeves by epicyclic gearing

Fig. O.—Longitudinal sectional view of the McIntosh motor in which the two sleeves are operated from an overhead eccentric shaft

Fig. P—Transverse sectional view of the McIntosh motor, showing the relation of the sleeves to the ports of admission and exhaust

Fig. Q—Sectional view of the Chalmers motor, showing the two spherical sleeves interposed between the piston and cylinder walls and the intake and exhaust passageways

Fig. R—Longitudinal sectional view of the Carroll rotary sleeve valve motor and part section of a cylinder showing how the ports are uncovered

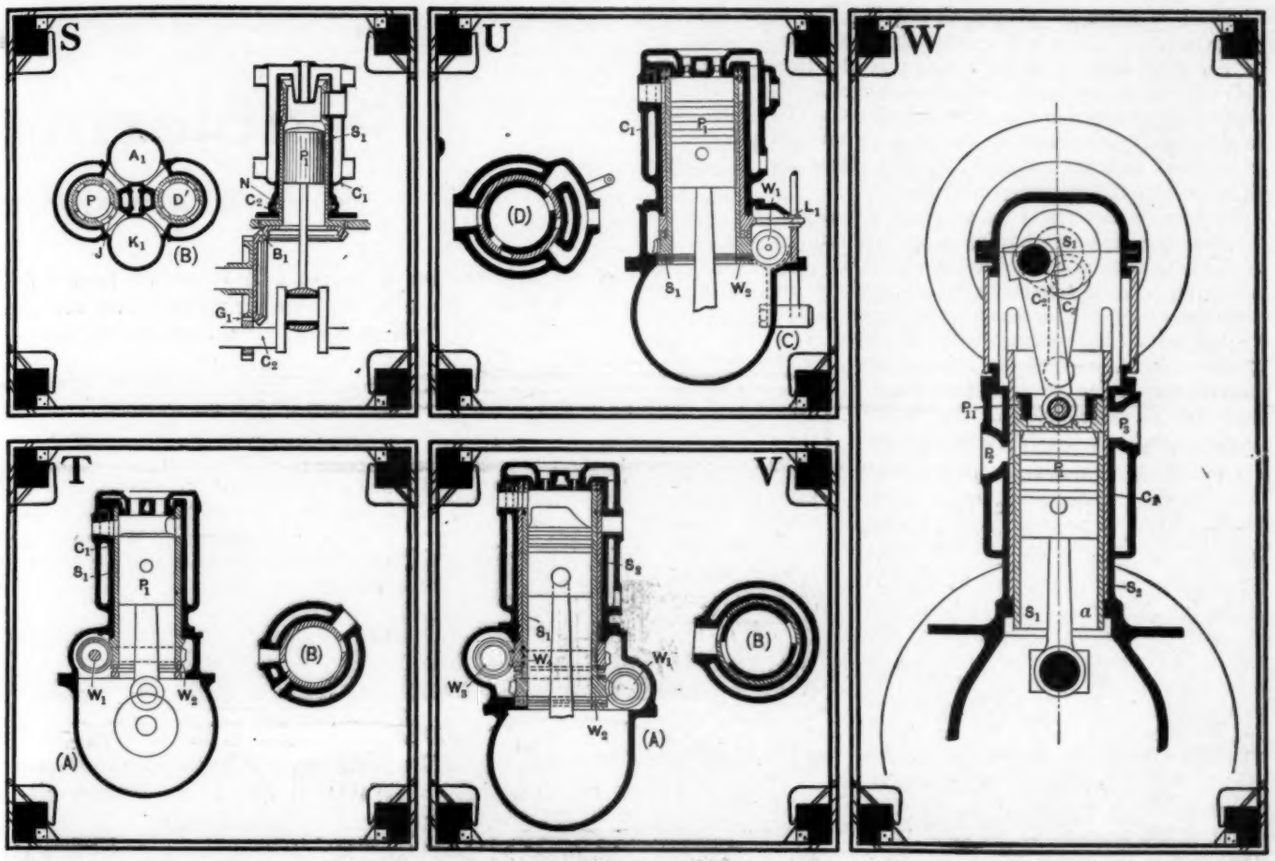


Fig. S—A shows operation of Callow & Humphrey rotary sleeve valve motor by means of bevel gearing. B, sectional view of cylinders, showing relation of packing ring to sleeve

Fig. T—Section of the Kitchen motor, showing how a single sleeve of the rotary type is operated by worm gearing

Fig. U—Another example of the Kitchen motor in which an outer sleeve is interposed between the rotary sleeve and the cylinder wall in order to regulate the admission and exhaust

Fig. V—A, sectional view of a further example of the Kitchen motor in which two sleeves of the rotary type are driven by worm gearing. B shows the relation of the water jacketed cylinder to the two sleeves

Fig. W—Sectional view of the Sears reciprocating sleeve valve motor, the sleeve being operated by an overhead eccentric shaft; in this type two pistons are used in each cylinder

head C1 and inlet and exhause ports P1 and P2 as in the Knight motor, and the sketch (B) shows the four pairs of sleeves for an equal number of cylinders operated from an eccentric shaft E1 placed slightly in advance of the front cylinder of the motor, imparting motion to arms A1 and A2 lying parallel to each other in the plane of the crankshaft, the diameter of the cylinder apart and bell cranks, connecting these arms to the sleeves in the respective cylinders of the motor, imparting motion thereto.

Carroll & Ripley Use a Single Rotating Sleeve

In Fig. R showing the elevation of a motor in part section, and a single sleeve S1, concentric with the piston P1 in the cylinder C1, with an inserted head H1, with means for water cooling, the sleeve S1 is rotated taking power from the crankshaft C2 through the bevel gear set G1 to the spur gear G2, meshing with a gear G3 on the lower extremity of the rotating sleeve. As the sleeve rotates it covers and uncovers suitably contrived ports according to the four-cycle principle.

The sleeve of the adjacent cylinder is also fitted with a toothed ring which meshes with the tooth ring G3 and in this manner takes motion therefrom. The small section of the cylinder head shows the sleeve as it is related to a post when either on the intake or exhaust stroke. The sleeve extends throughout the whole length of the cylinder, its port opening being sealed during compression and explosion by means of a semi-ring which is located in a corresponding recess, formed in the periphery of the head and a flat spring placed between the inner face of the semi-ring and the bottom of the recess. Packing rings are located in the head as a security against leakage.

Callow & Humphrey Employ a Rotating Single Sleeve

In Fig. S showing a cylinder of a motor in section, the sleeve S1, in the cylinder C1 is concentric with the piston P1, and the sleeve is rotated from the crankshaft C2 through a halftime gearset G1 and a bevel gearset B1 with one of the bevel gears flanged to the lower extremity of the sleeve S1. The sleeve is provided with packing rings at the approach of both extremities protecting ports against leakage, controlling the inlet and exhaust flow to these ports in the cylinder walls. The section (B) through a pair of cylinders shows the horizontal section. The port E in the sleeve is slightly larger than the port J in the packing ring, so that the pressure in the cylinder during compression and explosion stroke acts upon the exposed parts of the packing ring and secures good contact between it and the cylinder wall. At other points in the sleeve apertures D and D1 are provided for the purpose of increasing this effect. A gas admission chamber A1 and expansion chamber K1 are provided in communication with the inlet and exhaust ports of the cylinder respectively. Near the lower end of the sleeve S1 in Fig. S a collar C2 rests in a bearing N in the cylinder base plate.

J. G. A. Kitchen Contributes a Quota of Sleeves

Fig. T gives sections A and B of a rotating sleeve type of motor and referring to section A the sleeve S1 between the piston P1 and the cylinder C1 is given rotation by the worm W1 and the worm wheel W2, the latter being on the bottom end of the sleeve within the cylinder and the rotation of the sleeve covers and uncovers the inlet exhaust port successively according to the four-cycle principle.

Kitchen also worked upon a design of a sleeve type of motor as shown in Fig.

U which is given in sections C and D. The inner sleeve S1 is operated by a worm W1 in mesh with a worm wheel W2 in the same manner as the rotation of the sleeve in the cylinder as shown in Fig. T. The two sleeves in Fig. U are concentric with the piston P1 of the cylinder C1. The outer sleeve in this motor is actuated by the lever L1 through a controlling mechanism, and the ports in the outer sleeve are so arranged as to control the incoming mixture.

Kitchen has also worked upon the double sleeve type of motor as shown in Fig. V showing a section through the cylinder at A and a section across the cylinder at B. In this motor the inner sleeve S1 is rotated by means of the worm W1 meshing with the wheel W2, and the outer sleeve S2 is given rotation by the worm W3 meshing with the wheel W4. The section B shows the relation of the ports in the sleeves, they being covered and uncovered, due to the rotation of the sleeves and the relation that exists between them.

I. E. Sears Operates a Pair of Sleeves from the Top

Referring to Fig. W showing a section through the Sears motor, and the sleeve S1 concentric with the pistons P1 and P11 in the cylinder C1, covering and uncovering ports P2 and P3. Reciprocating motion is imparted to the sleeve through the eccentric shaft S1 by means of the connecting rod C2 for the auxiliary piston, and the connecting rod C3 for the sleeve. The sleeve is shown with the ports covered, and the operation of the motor conforms to the four-cycle principle. This motor differs from all of the other types illustrated to the extent that an auxiliary piston works in conjunction with the main piston in the cylinder.

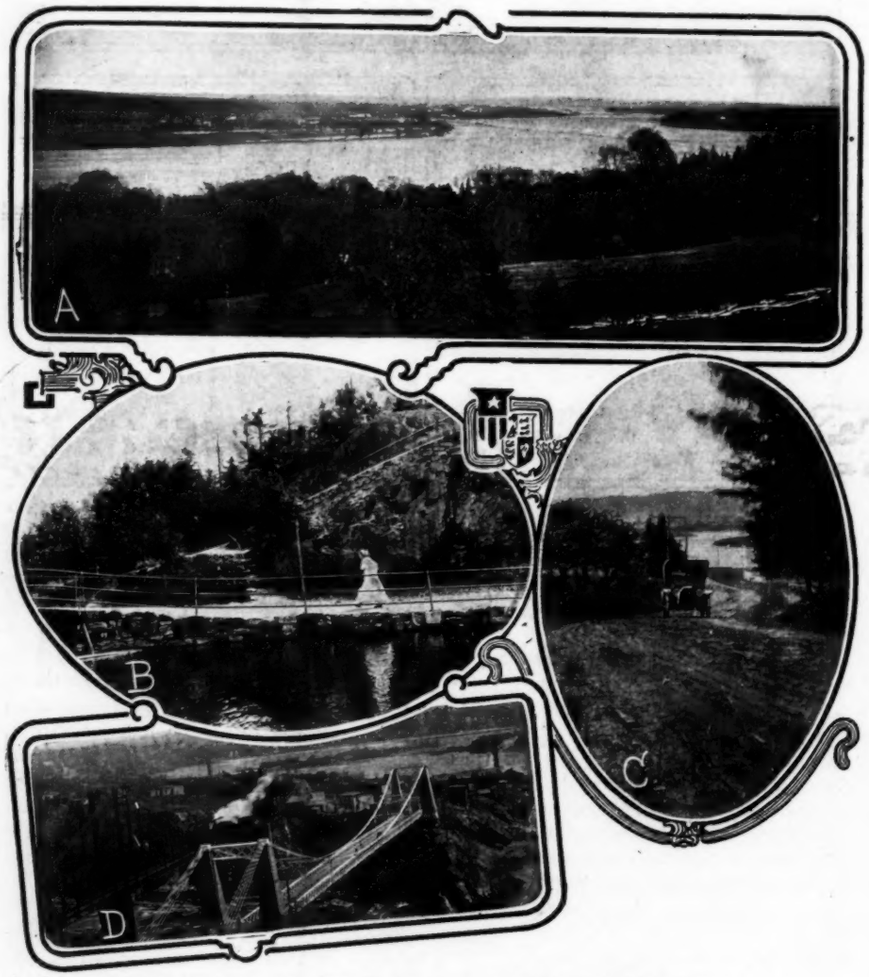
THE KAISER'S MOTOR CAR "FLEET."—Emperor William of Germany has just purchased four more new types of automobiles, thus augmenting his motor car fleet to thirty and again emphasizing his stand as an enthusiastic motorist. The majority of his machines are of German and French make. Six of these cars are utilized as luggage vans. The Kaiser keeps five of his automobiles at Corfu. No other person is permitted to possess a horn like that used on His Majesty's motorcars, the type of horn being that of a peculiar fanfare. When in commission the car bears the Imperial Standard flag, which flies beside the chauffeur by day. This ensign is replaced at night by an illuminated glass shield, revealing the Standard in regulation colors.

NEW FRENCH TRUCK BECOMING POPULAR.—France has just introduced a new type of motor truck. It is equipped with a tilting platform, about thirteen feet in length, and a capstan. The truck has a capacity for carrying loads of great weight, which, by reason of platform and capstan, are handled both in the loading and unloading at a wonderful saving of hand labor. The platform is tilted over the rear axle, while the leading truck is run out upon the ground. After having loaded the goods upon the truck, the workmen draw the truck back upon the tilting frame by means of the capstan. The frame is then tilted back and locked in its place. Not only have manufacturing concerns and commercial houses adopted the truck, but the military authorities have put it into commission.

Motoring in M

Touring in the L

Some information as to the best routes to follow in taking an au fellow's masterpiece, with pertinent data, reinforced by a mo routes, by land and sea, by which the motorist may reach N



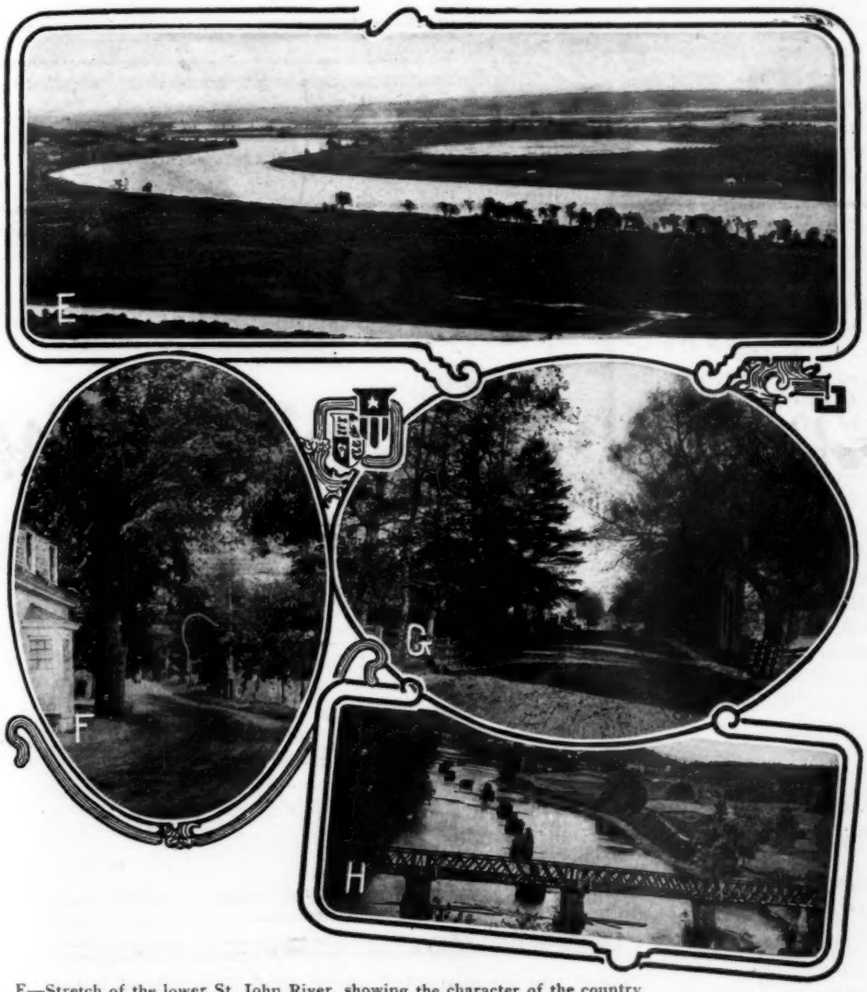
A—An upper reach of the St. John River, taken from the University at Fredericton
B—Spillway at the outlet of Lily Lake, in Rockwood Park, St. John
C—Picturesque road leading up out of Grand Pré
D—Reversing falls at St. John, N. B., showing bridges, river and factories

ONE of the most needful adjurations to give the automobile tourist who would venture into the Maritime Provinces of Canada is "Keep to the left." Nor should the frisky driver forget that he must not trust the occasional level stretches of gravel road, which invariably terminate with an atrocious culvert, calculated to put the stoutest spring out of business. A car recently came from Fredericton with both front springs broken straight through the middle, as if cut with a knife. Then there are the hidden sharp turns at the bottom of steep pitches and on high, narrow embankments which one would do well to watch for. The most flagitious of these medieval road tortures are the stones which stick up in the road as if to test the toughness of the outer casing. At intervals in the early part of the season one encounters those patent road de-

Modern Acadia

Land of Evangeline

automobile tour through the territory made famous in Long- map and excellent illustrations, showing the most comfortable Nova Scotia from New England. By Henry MacNair.



E—Stretch of the lower St. John River, showing the character of the country
F—The tourist, on entering Digby, is impressed by its quaintness
G—Type of road to be found frequently; this one is at Gagetown, N. B.
H—Peniac Bridge across the Nashwaak River, near Marysville, N. B.

stroyers which scrape the mud, filth and vegetation out of the gutters into the middle of the road, rendering it all but impassable until the friendly showers wash it all back again. After plowing through some of the road which has been "fixed" one occasionally comes upon a modern road drag which is doing sane and satisfactory work at a minimum expense, and no other argument is necessary to convince one of the superiority of the road drag over the road scraper than to travel over two adjacent sections worked by these machines respectively.

Having decided to be content with an average of twelve miles per hour and to forget the bumps in the wonderful historic and scenic interest of this country, the tourist will find a trip to Acadia an experience which he will never forget. The accompanying map shows the principal touring routes in this section with a connection from New York along the shore of New England, directions for which are shown in detail in Volume 2 of the Automobile Blue Book. Or one may ship his car to St. John or to Yarmouth, taking up the trip at either of these places. Perhaps the most satisfactory overland route to St. John is via Bangor, Bolton and Fredericton. From St. John two very interesting round trips offer themselves, the first being from St. John to Moncton, Truro, Halifax and Digby, returning to St. John by steamer or going on to Yarmouth and returning to Boston by steamer. The second, going from St. John to Fredericton, then across the heart of New Brunswick to Chatham, returning to St. John via Moncton. Another plan would be to drive from St. John to Edmundston, ship the car to Campbellton and then along the beautiful shore of Baie de Chaleurs and the Northumberland Strait to Moncton! then to Halifax and Yarmouth, returning to Boston by steamer. All of these roads are passable, and there are no unsurmountable difficulties, but the driving should be done with extreme caution and no great speed attempted. The tourist entering this part of Canada will find it necessary at the port of entry to arrange for a bond covering the amount of customs on the machine, which is 35 per cent. of the valuation. He must then secure a driver's license and register his car under the laws of Canada before proceeding.

The first impression of St. John is that of a very dull and dingy seaport, although it is picturesquely situated at the mouth of the St. John River and is historically interesting from the fact that Champlain and De Monts visited the harbor on the day of St. John the Baptist, June 24, 1604. The first European settlement, however, was made in 1631 by Charles de la Tour, who built a fort on St. John harbor. It would be interesting to follow the varying fortunes of La Tour and his successors as Acadia passed in turn from the British to the French and from the French back to the British. The real existence of St. John did not begin until after the landing of the United Empire Loyalists in 1783. These came from the neighboring United States, not desiring to unite their fortunes with the young American nation.

Among the various points of interest about St. John are Market Slip, the landing place of the Loyalists, where still stands a town bell used for calling workmen to labor and from labor to refreshment. Perhaps the best known natural feature is the reversing falls of the river St. John, where the river makes its way through a channel 450 ft. wide between tall cliffs of limestone. Here the tide rushing outward through the narrow channel gives one the impression of rapids or falls, whereas the incoming tide which here rises to about 25 ft. rushes in and reverses the condition. The favorite and most picturesque drive out of St. John is up the valley of the beautiful Kennebecasis, which extends for about 50 miles to the northeast. This road is the one to be taken to Moncton. Passing out of the Kennebecasis Valley, the tourist ascends a ridge from the top of which there is a fine view looking back. Then comes a descent into the valley of the Petitcodiac River, whose wet clay slopes at low tide give one the impression of a recent freshet. Moncton was named for an English general and is best known for the tidal bore which comes up the Petitcodiac River twice daily. This

wave comes in at the beginning of the inflowing tide and sometimes reaches a height of eight feet. The drive from Moncton to Truro down the isthmus is picturesque in spots, but unless the coast road is taken through Parrsboro one is very likely to find rough going.

One of the most interesting parts of the trip to Halifax is along the chain of lakes which begin south of Shubenacadie. Halifax might be called the Ultima Thule for American automobile travel, for beyond it one cannot go. The city itself boasts of several good hotels and is by far the most interesting and picturesque city of the two Provinces. Its most conspicuous feature is the Citadel, which occupies a commanding position at the topmost elevation of the small peninsula upon which Halifax is located. This hill was fortified in 1778, but the present fortress was begun in 1794. From the Citadel an unexcelled view of the city harbor may be had.

The drive from Halifax to Windsor, a most interesting one, follows the shore of the harbor to Bedford, when it ascends Mt. Uniacke on a very rough and stony stretch. At Windsor is the head of the Basin of Minas, made immortal by Longfellow in his "Evangeline." Shortly beyond the road leads through Grand Pré, the scene of the principal happenings so vividly outlined in that wonderful drama-poem. Leaving the Basin of Minas, the road leads over a low bridge and descends into the Annapolis Valley, whose beauty and charm have often been sung.

At Annapolis Royal is an old fort dating from 1660 and a monument to Sieur de Monts. Digby is a picturesque little village at the mouth of the Annapolis River, which passes into the Bay of Fundy through Digby Gut. Steamers ply between this point and St. John, and if one is tired of the trip the boat may be taken across the bay, or the trip may be continued to Yarmouth, where there are excellent hotel accommodations and steamer connections to Boston.

Of the other interesting automobile trips to the Provinces the most popular is from St. John to Fredericton, either by the river road or the back road, the river road being the most in favor on account of the beautiful views of the St. John. From Fredericton the tourist should follow the valley of the Nashwaak River and descend into the valley of the Miramichi, known as the fishing grounds of Canada. From Chatham an indifferent road runs across the marshes through several small villages into Moncton, and the return trip is made to St. John through the Valleys of the Petticodiac and Kennebecassis Rivers.

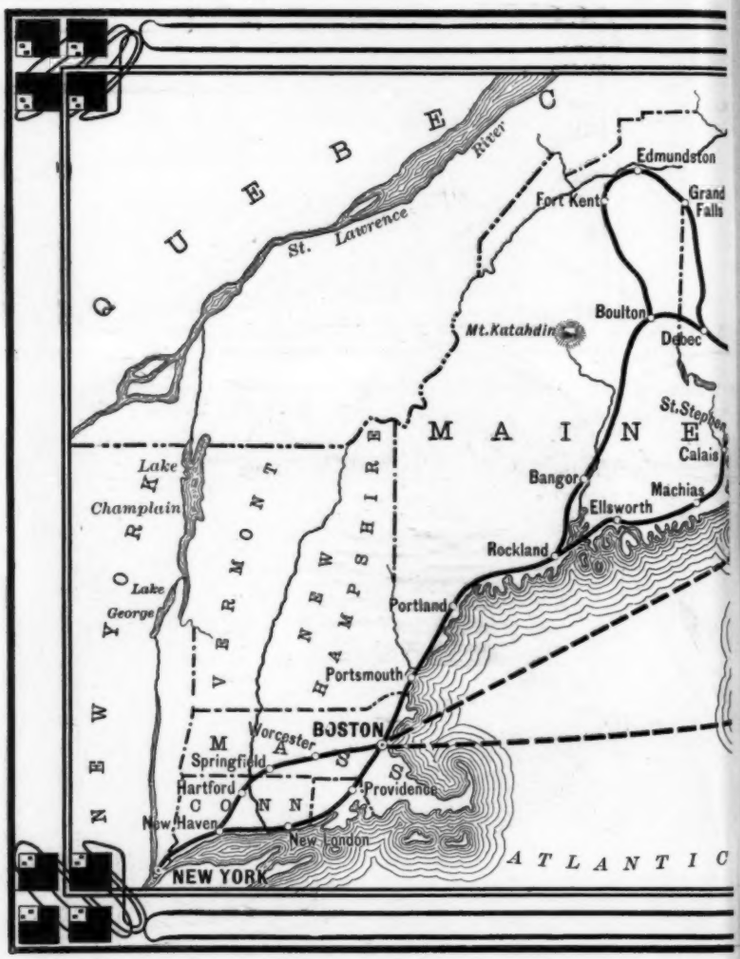
In Further Relation to Lubricating Problems

Charles E. Duryea presents additional argument in support of putting the lubricating oil into the gasoline and supplying these products to the motor in mixed form on the ground of simplicity.

I AM unable to get away from the feeling that you, for some reason, are opposed to accepting a good method of oiling. I am unable to find anything in your argument that is really against the mixture method as proposed by me. That there is, as an inadvertence, some mixing of the oil with the new charge in the crankcases of every two-cycle engine goes without saying. But what of it? The mixture method of feeding oil into a two-cycle crankcase, according to my view, is not an inadvertence. I look upon it as a well-planned and accurately operating method, which is superior to other methods. You might say that it was an inadvertence when Columbus discovered America, but he worked under an up-to-date plan and deserves credit accordingly.

Your play on words in your endeavor to show that the mixture method of feeding oil is a complex method, in my judgment, is unworthy of you. I venture to assert that none of your readers have been confused by the terms employed. They know that when we speak of the virtues of simplicity we do not refer to a type of machine which is lacking in some vital part, whereas we do have in mind the type of machine that has the minimum number of parts and is capable of performing a given service. The mixture method of lubrication dispenses with the oiling machinery as far as the engine lubrication is concerned, substituting a method which I consider more nearly correct in action and more certain to deliver the desired results. This, I take it, is the kind of simplicity that the user wants.

That the mixture method of oiling is mostly applied to two-cycle engines is no argument against it. One four-cycle engine that I know of is built that way, and I have no doubt that others will be so made. Practically every engine nowadays is built with a tight crankcase to keep out the dirt. Just why a mixture may not be carried into the tight case and



Map showing the geographical relations of the New England States to Nova Scotia, (Courtesy of the Official

out again, as is done by Holsman, I do not see. It is very possible that engine makers have something to learn yet. It is certain that such a method would render needless some of the parts now considered necessary, and this is the thought that every up-to-date engineer keeps in mind and works for. The engineer knows that needless parts add needless cost in the first place, may offer trouble in the second place, must be kept in repair in the third place, and eventually replaced in the fourth place, not to mention the weight that the presence of these devices would necessarily add, nor forgetting the power that they absorb. I trust that these discussions will at least make designers think.

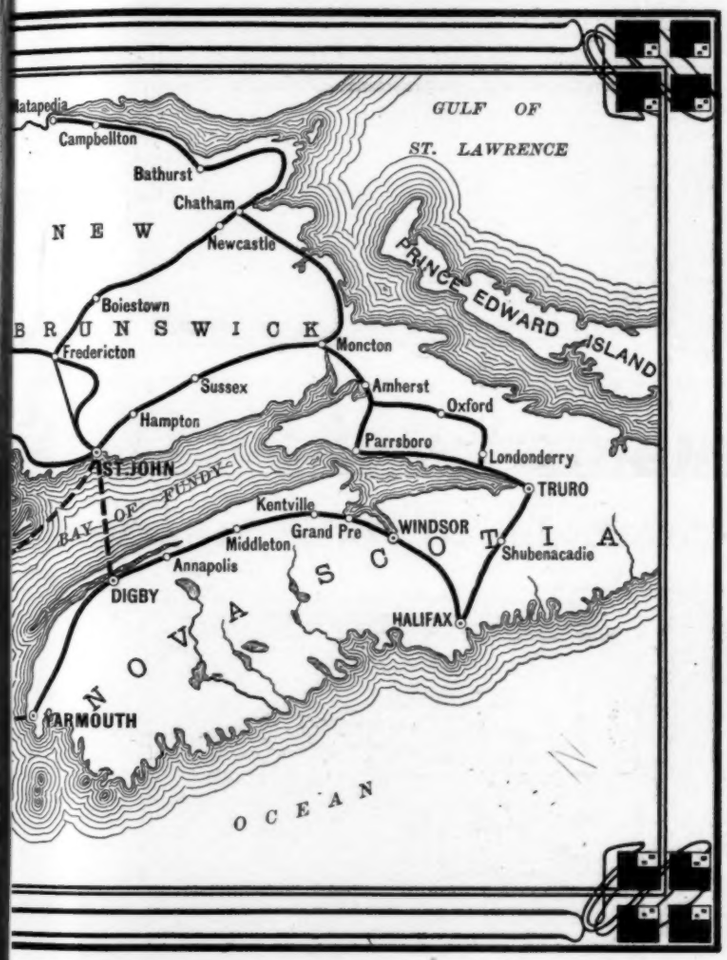
In the absence of a means for regulating discussion, the germ of irrelevancy creeps in with great persistence, and argument is prone to browse around over a 40-acre lot, making it substantially impossible to adhere to the original subject and to arrive at some conclusions.

The first principle of efficient lubrication is founded on the idea of an

unbroken film. The only way that an unbroken film can be assured, referring to the film of lubricant between the journal and the bearing, is to employ a suitable grade of lubricating oil and to be sure that it is not adulterated. As to the question of adulteration, it is not difficult to reach the conclusion that lubricating oil with gasoline in it is adulterated, nor does it matter whether the gasoline is put in it on purpose or otherwise.

Granting that Columbus discovered America, it is not without contending that the good Queen Isabella furnished the lubricant up to an unadulterated standard, and she must have appreciated how necessary it was to avoid adulteration, since there are those who suspect that she put her jewels in pawn to get the gold (lubricant) that Columbus used as the price of his outfit. In the Holsman motor, which is used as an example for designers to go by, it still remains to say that the plan was in the nature of an inadvertence, in view of the fact that Holsman would have had great difficulty in doing the work in any other way but the one as chosen by him. It is no argument to state that a thing is better if it is done in a certain way, if it is a fact that the doer of the job has none but a Hobson's choice.

We are struck by the funny way that users have of showing their high appreciation of simplicity, for, as Mr. Duryea states, "this is the kind of simplicity that the user wants." Statistics would seem to indicate that the users of automobiles are so taken with the mixture idea that 99.9 per cent. of them invest their money in something else.



with the best routes to and from the Land of Evangeline, both by land and water Automobile Blue Book)

Hot Weather Tip

Those who use the ordinary type of bulb operated horn may find that during the hot weather the bulb, which is usually made of rubber, becomes very sticky. This can be overcome if a small bag is made out of a piece of linen and sewn over the bulb. A more permanent fitting can be made of leather and attached by a lacing.

GOVERNMENT MOTOR CAR SERVICE IN EAST AFRICA—From the East African Protectorate word comes that a plan is being worked out whereby motor car service is to be established by the Government for the accommodation of the postoffice, and likewise for landowners who raise perishable produce. The highways have been improved and the outlook for automobiles in this section is bright.

It Stands to Reason—

THAT you cannot discriminate against the motor in your automobile without being paid in coin of the same realm.

THAT discontent is catching; if you invest in a discontented automobile you will experience discontent within a week.

THAT a good automobile should not be disassociated from a kindly disposed owner.

THAT a dramatic critic of some power might have a lot to say about an intoxicated driver.

THAT the owner of an automobile should deprive the dramatic critic of his opportunity.

THAT subjects for discussion should not include deflated tires in service.

THAT a straightforward type of motor in a car is entitled to frank and fair treatment.

THAT a drone in the chauffeur's seat makes an active repairman in the shop.

THAT drudgery is a condition that rests under the shadow of previous neglect.

THAT a chauffeur arrayed in an alcoholic mind is an economic blunder.

THAT chauffeurs are too often the victims of a bad example.

THAT a long stop at a road house is the first indication of a wrecked automobile.

THAT "sand" is more appropriate in the gizzard of the driver than it is in the gearbox.

THAT the glamor that is hinged to a coat of red paint on the body is not necessarily the sign of a good automobile.

THAT the designer who will make a little room for wearing apparel will be on the highway to fame.

THAT the rattle of tools in a poorly contrived box makes faces at a silent motor.

THAT a self-binding reaper from the land of trouble has a monkey-wrench in the hands of a "bonehead" as its partner.

THAT fixing an automobile piecemeal is like handing money to a burglar for safe keeping.

THAT the path of glory may lead to a grave, but it is a short one for the fellow who drives fast without looking ahead.

THAT it is better to "get a horse" to rescue an automobile than it is to get an ambulance to succor a reckless driver.

THAT the shortest distance between two points is not necessarily through a fence into a corn-field.

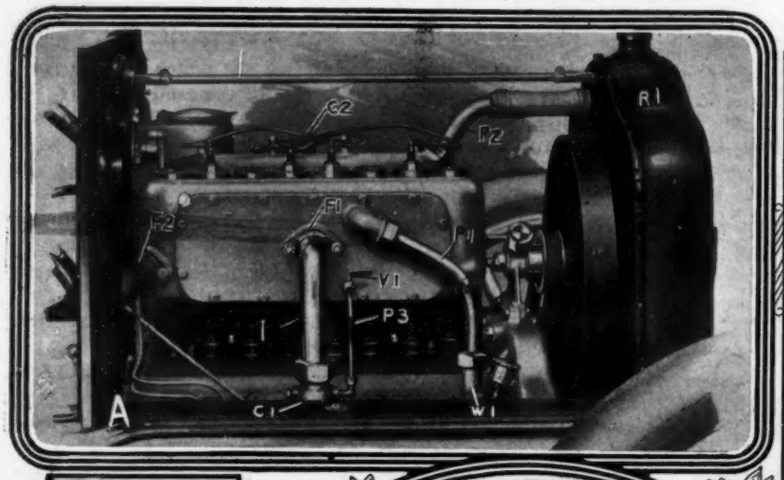
THAT it is useless to waste sentiment upon a motor—what it needs is lubricating oil.

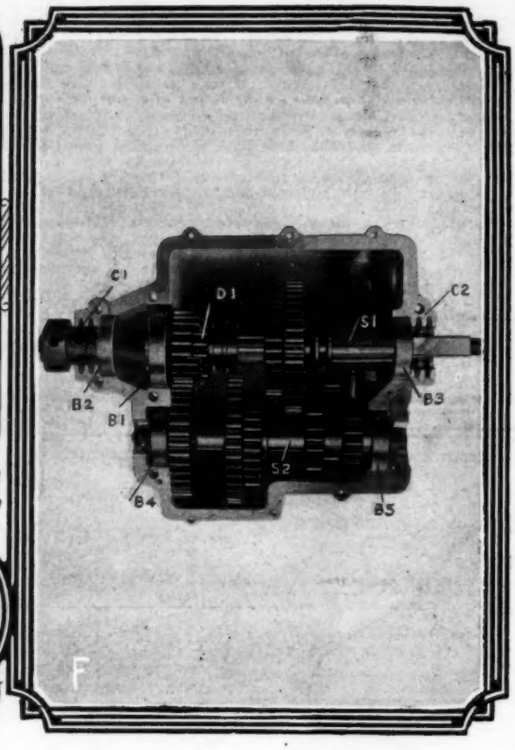
THAT motors must have an enjoyable time telling each other funny stories when they get back to the garage.

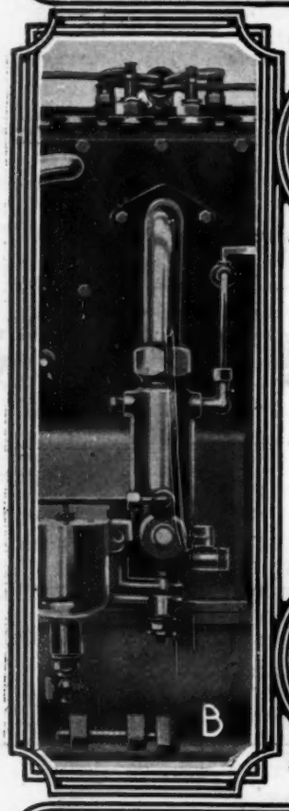
Standardizing Signals

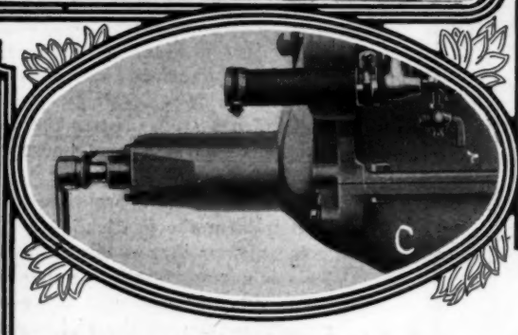
The feasibility of securing the adoption of a law which shall render it obligatory for motorists in the United Kingdom to equip their cars with uniform warning signals has been discussed, it being asserted that the present multiplicity of such devices has a tendency to "rattle" pedestrians.

ENGLISH law makes it compulsory upon automobilists to "carry a bell or other instrument" on motor cars. To this end the Local Government Board says that the signal "shall be used whenever necessary." This rather indefinite phrase is sometimes hard to interpret, for example, in a case of alleged neglect, when the matter is referred to a Magistrate. But the problem of the motor car horn, "hooter," siren or "road clearer" has become so great and the kinds of "instruments" in use so numerous that both motorists and pedestrians are in a muddle. To get out of it they are considering the feasibility of calling upon the respective Local Government Boards to agree upon some one definite type of horn to be used. Throughout the country English motorists seem to show a liking for a certain type of bugle, which contains ten notes, comprising the diatonic scale of the key of G with F sharp and an extra A added.



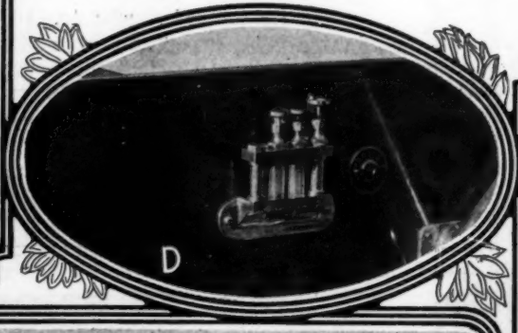


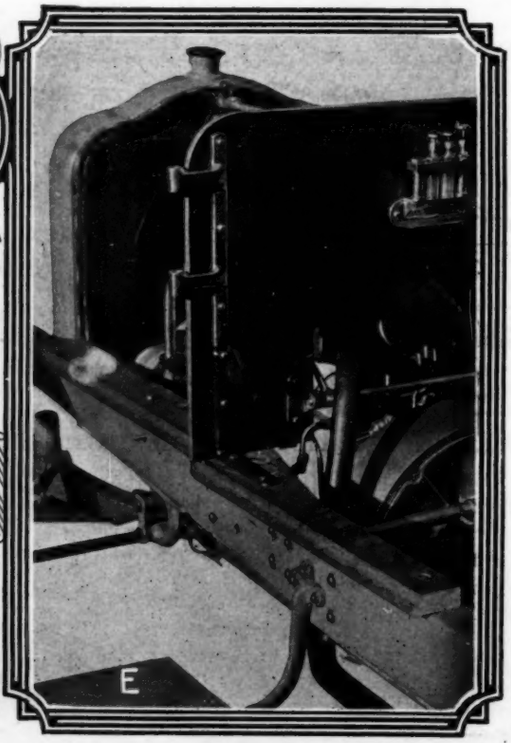


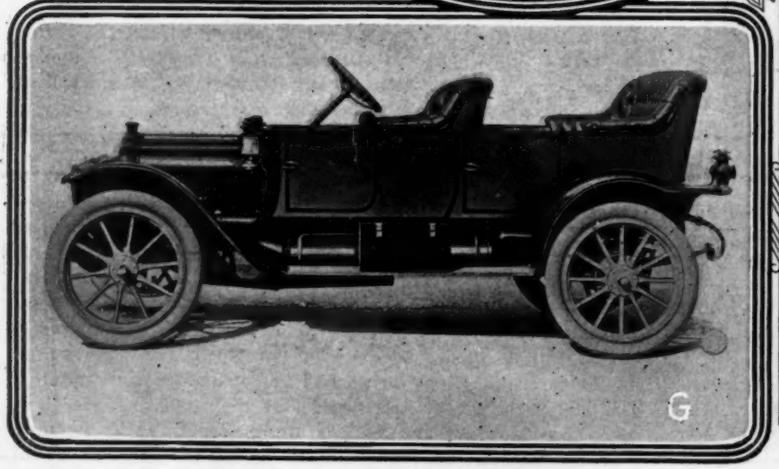


White Company Adds "Six"

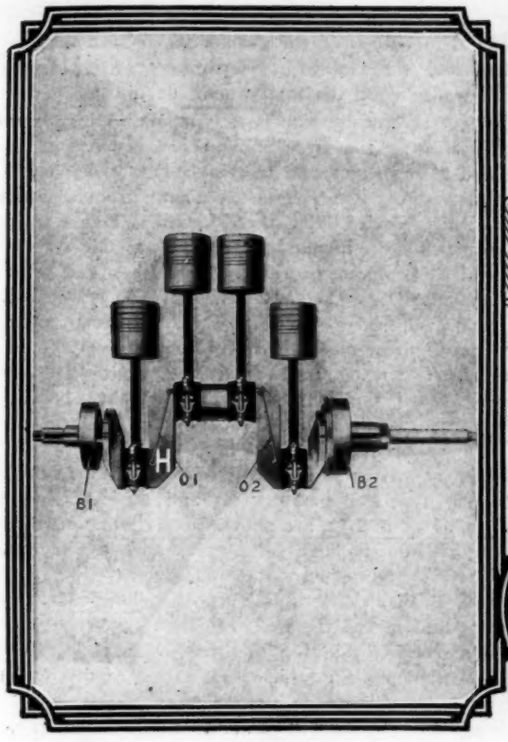
Continues to Make Steamers

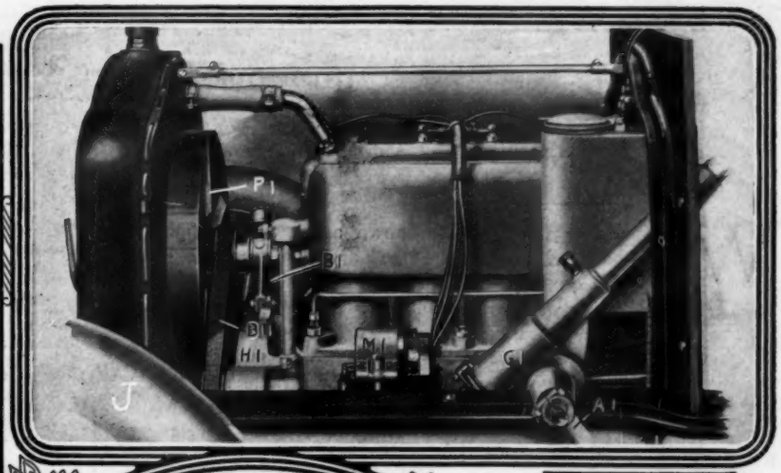


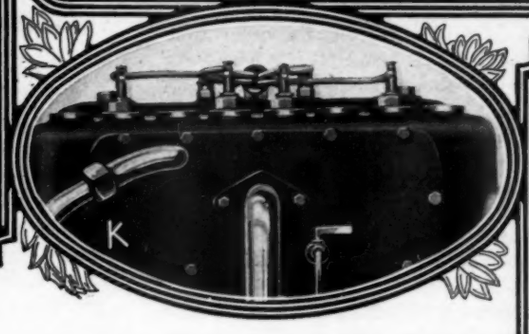


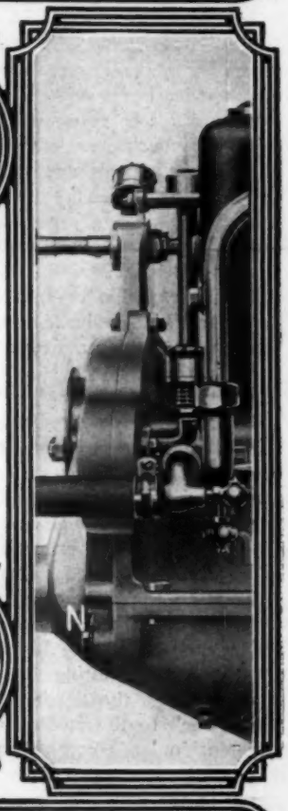


A—Left-hand side of the "GE" White motor with valve cover removed. B—Showing the carbureter of the 30-horsepower White gasoline engine together with hot-water jacketing and valve covers. C—Front end of the motor, showing the extension of the crankcase and starting crank. D—View of the dash of the White "30," showing the switch and sight-feed lubricator. E—Side view of the 1912 fore-door White touring car. F—Gearset of the White 1912 gasoline car, showing the high-speed pinion in mesh. G—Part view of the 1912 White "30" chassis, showing the method of suspending the transmission and the operation of the gear-shift.



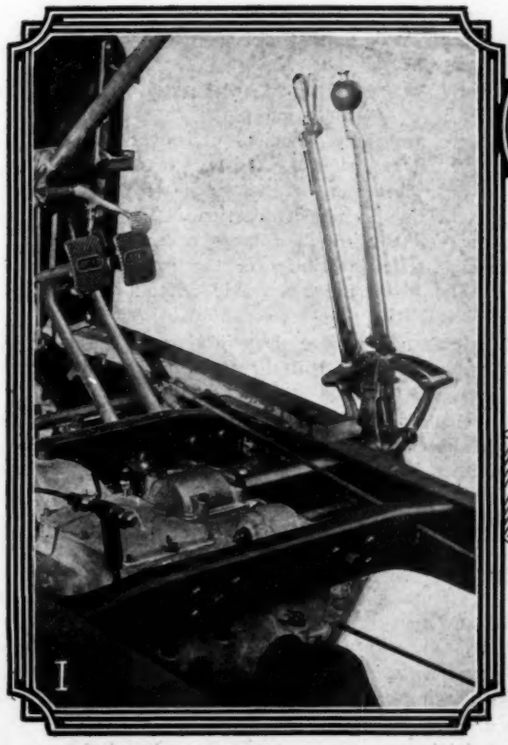


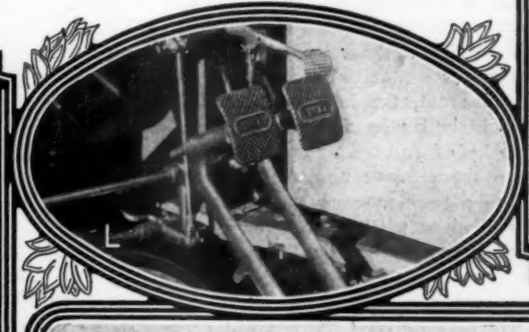


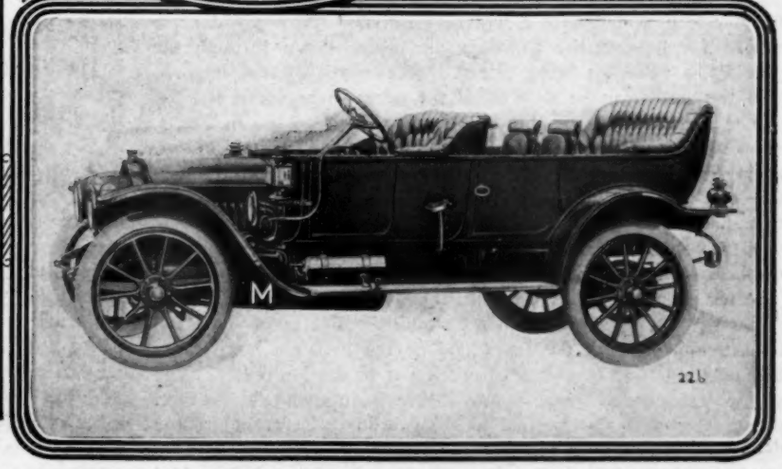


to Gasoline Automobile Line

in Response to the Demand







H—Crankshaft of the White 1912, showing the ball bearing supports and the oil leads. I—Front end view of the White "30" chassis, showing the leather-faced clutch, the broad section of the chassis frame, and the shackling of the front springs. J—Right-hand side of the gasoline "GE" engine, showing the position of the magneto, fan, steering gear and lubricating oil tank. K—Side view of the White gasoline 30-horsepower motor, showing the intake manifold, water connection and spark plug. L—View of the foot control, showing the clutch, brake and accelerator. M—Side view of the seven-passenger White gasoline touring car with left-hand control. N—Side view of the front of the 30-horsepower White motor.

In view of the demand as it is felt by the company for steam as well as gas automobiles, the steam models are continued substantially as heretofore, and the gas models have been revised and brought up to date, adding a "six," according to the illustrations given with this article, and in line with the following discussion.

WITH a six-cylinder to be known as a "60," including suitable revisions of the "30" and "40" models, the White Company, of Cleveland, Ohio, is prepared to meet its clientèle with a view to filling its devious wants, with the same degree of care and precision that has been the underlying principle of the company's activities heretofore. A striking feature of the new six-cylinder model lies in the fact that the six cylinders are cast *en bloc*, thus bringing this new car into the same school of design as that which characterizes the four cylinder models of the same make.

The 1912 line comprises four different chassis under catalogue designations "GB," "GE," "GAD," and "GF." The "GB" model is the 30-horsepower chassis mounting a limousine or a landaulet body. The "GE" is the 40-horsepower chassis mounting five or seven-passenger touring bodies, also limousine, Berline limousine or landaulet bodies. The "GAD" is the 30-horsepower chassis mounting a new touring body, and the "GF" chassis represents the new six-cylinder model. This model is made up with a seven-passenger touring body, or the purchaser may have the option of a landulet, limousine or a Berline limousine.

All bodies, whether for open or closed cars, are built with foredoors. The body list also includes a toy tonneau on the "30" chassis, and a roadster body on the "30" and "40" chassis.

Discussing the Mechanical Features of White Gas Cars

Referring to Fig A, showing the left-hand side of the Model "GE" engine, the carbureter C1 is attached to the upward sweeping intake I1, leading to a flange F1 about midway on the block casting of the cylinders. The water pump W1 delivers water to the cylinders through the pipe P1 circulating the cold water around the inlet and exhaust valves which are on the same side of the motor, and the water passes out at the top through the pipe P2 to the radiator R1 in front, the latter being of the well-known White design, and similar in appearance on gas and steam models of this make of car. The exhaust passes out through the fitting F2 to the exhaust pipe which sweeps down, clearing the flywheel, to a position clear of the chassis frame, back to the muffler, and away to the atmosphere. The high-tension leads come through the conduit C2 to the top of the cylinder casting and are connected to the four spark plugs placed in the covers over the respective inlet valves. The carbureter is provided with a water jacket, and the hot water required for heating the auxiliary air passes down through the pipe P3, a valve V1 being placed in the length of the same, so that the water can be shut off if the occasion requires.

The opposite side of the "GE" motor is presented in Fig J, showing the magneto M1 near the front end of the motor, taking its drive by a shaft terminating in a gear, the latter being in the halftime train and enclosed by a housing H1. On this side of the motor, the steering gear G1 comes into view with the steering arm A1 on the end of a shaft extending out of the steering gear housing above the top of the chassis frame. The air propeller P1 is substantially mounted on a bracket B1, and power is delivered from a shrouded pulley on a shaft extending out through the front end of the halftime box, transmitting the power by means of a belt B11 to the fan pulley. The motor is suspended on the frame at three points, and this method of suspension is also applied to the gearbox. Referring to the details of the cylinder castings, the intake and exhaust passages are integral parts of the castings. It is claimed for this method of casting the cylinders that alignment is assured; moreover, the gases are delivered to the cylinders at a temperature favorable to ready combustion, and the disposal of the burnt gases is facilitated. The length of the crankshaft is minimized under this plan, and the resulting compactness of construction also reacts favorably upon the total weight of the motor.

The White type of transmission gear is shown in Fig. F with a direct drive at D1 and a large annular ball bearing E1 supporting the load at this point, and a second annular ball bearing B2 aiding in the support of this shaft. A double-grooved closure C1 excludes foreign matter from these bearings, and a similar closure C2 excludes foreign matter from the annular type ball bearing B3 which is placed to support the other end of the prime shaft S1 which is splined. The layshaft S2 is supported by annular type ball bearing B4 and B5 and foreign matter is excluded from them by means of covers placed over the ends of the housings. The transmission gear is conspicuous for its clean designing, good relations from the clearance point of view of the torque, and the excellence of the material employed.

The crankshaft as shown in Fig. H is of the two-ball bearing type with annular type ball bearings B1 and B2 near the extremities. Oil tubes C1 and C2 are shown in the lubricating system, and in order to defeat flexure the crankshaft is made with large-section throws and pins of the most approved form of material that is available for this purpose. The connecting rods are of neat design, and the well-fashioned pistons are provided with oil grooves in addition to three piston rings, and a condition of exact balance is established as a part of this undertaking.

The remaining illustrations will suffice to indicate consistency in methods of design and construction of the cars, and indicate how the various problems have been disposed of. Referring to the transmission gear it provides four forward speeds and reverse with direct drive on the third, making the gear changes selectively. The gears are of heat-treated steel. The clutch in the flywheel is of the cone-type and the leather facing is held in place by T-bolts with means for their ready removal if the occasion requires. The driving shaft is fitted with two universal joints, and no telescopic joint is employed. Leather boots are put over all joints to exclude foreign matter. Grease cups are provided at points of vantage. The coupling between the clutch and the gearcase is flexibly arranged, allowing for slight variations in alignment. The machinery equipment is protected from dust by a well-designed sheet-metal pan.

The rear axle is of semi-floating type. In the construction of this axle there are three principal divisions; the gearcase and the right and left axle sleeves. A heavy truss extends from the ends of the axle sleeves engaging a saddle on the under side of the gearcase, helping to support the load. The gears in the axle case are accessible through a large cover on the top of the axle housing. The jackshafts in the axle are of heat-treated steel. The gears are removable without splitting the gearcase.

The front axle is a one-piece drop-forging of the I-section made of .40 carbon steel. A ball thrust is interposed between the steering arm and the axle.

The crankcase is of specification aluminum in two sections. The upper section carries all of the working parts. The lower section is limited in its duty to the exclusion of foreign matter, and the holding of oil. It may be well to say here that the motors are of the long-stroke type. The 30-horsepower motor has a bore of 3 3-4 inches and a stroke of 5 1-8 inches. The 40 horsepower motor has a bore of 4 1-4 inches and a stroke of 5 3-4 inches. The six cylinder 60-horsepower motor has a bore of 4 1-4 inches and a stroke of 5 3-4 inches. Ignition is by high-tension magneto. The mixture is made by a White carbureter of the aspirating type with air valves graduated to supply a correct mixture under varying conditions of speed, the air being heated by means of a water-jacket.

The system of lubrication is a combination of "splash" with a positive feed. There is a direct feet to each of the two main crankshaft bearings. Each connecting rod bearing is also posi-

tively lubricated by means of all oilways that are cut through and carried on the crankshaft. These oilways are supplied centrifugally through oiling grooves on the crankshaft. Provision is made to insure an abundant supply of oil to the camshaft bearings.

The halftime gears are properly lubricated and a means for lubricating the water pump and magneto drive are also at hand.

The engine being water-cooled is supplied with the cooling fluid by means of a gear-driven centrifugal pump. A genuine honeycomb radiator is used, in the design of which an effort has been made to take advantage of all four sides of each air cell by providing water upon the adjacent surfaces. The water piping, like the rest of the piping throughout the automobile, is a well-executed piece of work. The side bars of the chassis are of heat-treated steel. Front springs on all models are of the half-elliptic type, and the rear springs on all models are of the three-quarter elliptic type. The steering mechanism is of the worm and sector type with ball-thrust bearings. All parts are of heat-treated steel. The gas and spark may be regulated from the steering wheel or by means of foot levers. The gear-changing and emergency brake levers are arranged at the side of the driver. The clutch and service brakes are operated by pedals. There are two brakes on each rear wheel acting on wide drums of wide diameter. The brakes operated by the pedals are fiber-lined, external constricting type. The emergency brakes, operated by the hand-lever, are internal expanding, metal-to-metal type.

Annular type ball bearings of liberal proportions are universally applied in all models. A compression release is used and operated through a small lever on the frame near the radiator which relieves the compression in the cylinders while the engine is being cranked. The mechanically operated valves are interchangeable. The inlet and exhaust valves are situated on the same side of the cylinders. The valves are made with integral stems, and the type of metal employed has been selected for its ability to resist distortion due to heat. The valve springs and stems, together with the relating mechanism, are set in a valve chamber within the cylinder castings protected thereby but accessible through openings that are covered by means of detachable plates. The camshaft of special heat-treated steel is entirely enclosed within the crankcase.

In the operation of these cars various innovations that count for comfort of the driver have been given a fitting measure of care, as, for illustration, the pedals are adjustable as to length and position, and thought has been given to the location of the steering wheel with respect to the seat and accessibility of the levers for purposes of control. The peace-of-mind of the driver is assured through the good office of a well-contrived lubricating system, the ease with which lubricating oil may be added at will, and the facilities for telling the driver how much of the lubricating oil remains, and the distribution of grease cups at points of vantage adds materially to the insurance feature, so that the probability of trouble due to lubrication, or noise due to undue wear of the parts, is avoided. The weight of the automobiles in proportion to the available power in each case has been fixed with a view to good road performance, and the harmonizing of the relations of the functioning units has been brought about by a careful study of the needs in the light of experience.

Charging for Repairs Not Ordered

Some garage owners have contracted the habit of overhauling their patrons' cars without authority, rendering a stiff bill, and holding the cars in the event of a refusal on the part of the owner to pay.

REFORMS come under the press of necessities, and the men who keep their automobiles in public garages are being impressed with the fact that the rental charge is but a small percentage of the total of the bill in some cases, due to the success with which garage repairmen find troubles in the cars of their patrons and to the further fact that work is done in the correcting of these troubles perhaps too soon. In the long run the owner of an automobile is bound to count the total cost, and it should not take him more than a year or two to arrive at the conclusion that a $300 garage in his own back yard, under the charge of a machinist-chauffeur, is a better investment than paying $30 per month to keep his car in a garage and an extra $100 per month to cover the cost of mysterious repairs that he never orders. Every owner of every automobile that is kept in a public garage should serve notice upon the proprietor of the garage that he will pay no bill whatever for any work done unless he delivers a written order for that work to the owner of the garage. In the meantime, there is a law upon the statute books of the State of New York which protects the owner of the garage from "bad pay," it being within the law for the owner of a garage to seize a car and hold it in his possession until the owner thereof pays for any repairs that may be made upon it. This law was intended for the worthy purpose of protecting repairmen from "dead beats," but here and there information comes to hand which goes to show that some garage repairmen undertake to overhaul automobiles that are stored in their establishments without getting permission from the owners of the cars, and they force the owners to pay for what they do not order by holding such automobiles ostensibly under this law until the repair bills are paid.

Blue Book Cars Under Way

Opening Up New Fields and Improving Past Endeavors

In order to cover as much ground as possible three Blue Book cars are now under way. This is one month earlier than in preceding years. Many new roads have been built during the last season and it is proposed to include these in next year's volumes. Another volume will be added to the 1912 list, making five in all.

IT is not so many years ago that the routes of America were comprised in one volume, but since 1907, with the aid of a fleet of cars, the territory has been enlarged annually, and last year's four volumes were a great improvement on the preceding years' production.

This year the fleet of three cars is starting one month ahead of previous years' schedules and will remain in the field of useful endeavor until the snow flies. The object of the three cars is to cover as comprehensively as possible previous routes, and besides planning new routes they will plot the new State highways that have been made during the last twelve months. These are becoming an important factor, as the good roads germ has taken hold of most rural districts, whose inhabitants grasp what the automobile has done for the sections where automobile traf-

fic has been opened through the roads being put in proper repair.

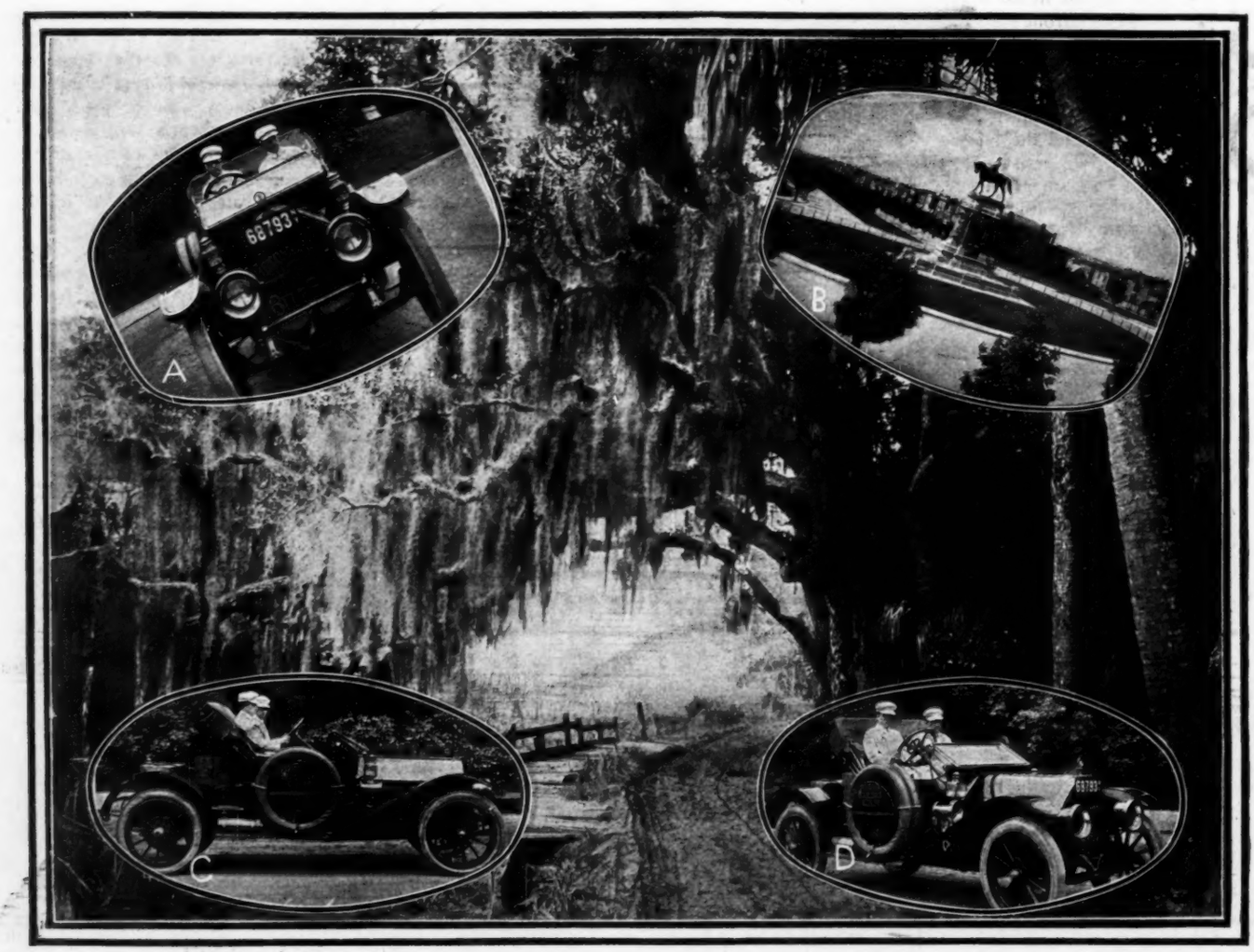
The Blue Book was started in 1901, and with yearly additions was, as before stated, comprised in one volume till 1907, when two volumes were found necessary. In 1908 it was enlarged and the three volumes which were published were highly appreciated by tourists. In 1910 four volumes were required to give the information on the territory that had been covered and many useful maps were added. The 1911 season saw the same number of volumes as the preceding year, but the information was largely added to and the usefulness to the tourist greatly enhanced. This year will see another addition in a volume which will comprise routes from the Mississippi to the Rockies, with extensions to the coast of the Pacific.

The car shown in the accompanying illustration will cover the ground included in Volume II of the Blue Book which comprises New England and Canada. This has been the favorite ground of many Eastern tourists, and it is expected that the car will cover 20,000 miles before taking to winter quarters. Much new ground will have to be gone over and it is the endeavor of the pilots to increase the fund of information as much as possible.

Car No. 2 will cover the territory included in Volumes I and III, which comprises the Province of Ontario and the State of New York. The volume covering Pennsylvania, New Jersey and the South is expected to be greatly improved, as the car will take advantage of the southern winter to extend its field when the other cars will be compelled to stop. This car is expected to cover somewhat over 25,000 miles.

Car No. 3 will take Volumes IV and V in hand, which includes from the Ohio to the Mississippi and from the Mississippi to the Rockies respectively. The schedule for this car is 30,000 miles, the additional mileage being due to the distance between the various towns. Extensions to the Pacific Coast will be included in Volume V, which will lead to a further extension in the future to the additional Volume VI, which will cover the Pacific Coast. The three cars will be distinguished by the signs placed on the radiator and sides of the cars.

SYNTHETIC RUBBER—It must be a long time before synthetic rubber seriously affects the price of rubber, but it has to be reckoned with. Dr. Gerlach has been giving his views on it before the Rubber Commission recently appointed by the German Colonial Agricultural Committee, and they are worth noting. In the beginning Dr. Gerlach was skeptical as to its value, and was very much surprised when bulk samples satisfied him that synthetic rubber possesses the essential properties of high-grade material. To what extent the new product will compete with natural rubber remains to be seen. The raw material of synthetic rubber is itself a manufactured article, the production of which, on a large scale, can only be undertaken by a few chemical firms, but there can be little doubt that artificial rubber will eventually appear on the market as a commercial product. Dr. Gerlach thinks that makers will take care that the output is not on a scale sufficient to depress the price of rubber. However that may be, producing costs will have to be largely reduced before serious competition with natural rubber is possible.—*Royal Society of Arts Journal.*



Three new Blue Book Good-Roads surveying cars started this week on a 75,000-mile mapping tour

Cause and Cure of Motor Car Noises

Knocks, Squeaks, Hisses and Pops That Worry

Detailing some of the common causes of noisy operation of the automobile's mechanism, and how to locate the components at fault, Victor W. Page, M.E., instructively discusses them from the viewpoint of the owner-driver, and suggests remedies for each of the annoyances. Taking the various systems of the automobile in turn, he points out the causes of noise in the respective parts and tells how they may be overcome, concluding with an interesting paragraph or two on hard-to-find knocks and squeaks that are due to unusual causes.

ONE of the most annoying conditions that may become manifest in connection with automobile operation, and one most difficult to detect by the average motorist, is that of noisy action while the mechanism is in use. This is especially worrisome because of the difficulty which obtains in tracing the noise to its source.

It is hardly possible to build a motor vehicle entirely free from noise, but it is not difficult to keep the mechanism so well adjusted and lubricated that the most distressing sounds will be entirely absent and only minor clicks, such as result from the clearance between the valve operating plungers and the valve stems, or the hum of the motor timing gears, will be noticeable. Some knocks presage rapid deterioration and untimely end of the part, indicating its distress, while others of equal magnitude do not foretell anything of import, being caused by looseness of some relatively unimportant part.

To be able to tell when a portion of the mechanism is defective by the sound is a knack that can only be acquired by experience, but some general rules can be given so the average motorist may become sufficiently expert to distinguish between the various noises, locating troubles by systematic search rather than the haphazard manner in which they are usually sought by those who do not have much mechanical experience.

Considering the power plant first, we find that the sounds commonly heard may be divided into four classifications, namely, pounding or knocking, squeaking or grinding, hissing or puffing and popping. Knocking is usually due to wear in bearings or looseness between other revolving or reciprocating parts. Squeaking is usually produced by contact of dry metals which are in motion relative to each other, and is an almost infallible indication of faulty oiling. A hissing or puffing sound always indicates a leak of gas under pressure, while a whistle generally shows that gas is blowing by a loose packing, or air is inspired in the engine at some point that should normally be tight. Popping noises may be evidenced at the carbureter or muffler, and are usually produced by conditions which make for imperfect combustion or slow burning of the charge.

The bearings which deteriorate soonest are those of the connecting rods; both the journals at the crankpin and those at the wristpin will wear in time even if well lubricated. The wristpin bearings have but a limited movement as compared with those at the lower end of the connecting rod; the pressures are great, the temperature high and the lubrication is not so positive as at the crankpins, so these bushings often fail before those of the lower end become loose.

Any looseness of the bearings will be manifested by a sharp metallic knock, though pounding does not always indicate that these parts are in poor condition. Deterioration of the connecting rod bearings is detected by removing the side plate of a one-piece or barrel-type crankcase or the bottom of a two-piece engine base and then endeavoring to move the rod up and down by the hand. Any play denotes lost motion, and, while a certain amount of movement along the horizontal axis of the shaft is permissible, there should be no large amount of vertical movement. The main bearings may be tested by raising the shaft by means of a jack placed under the flywheel or a lever fulcrumed upon the frame side member if the construction permits. If a lifting jack is utilized it should be so blocked up that the lifting ram is brought in contact with the outer periphery of the flywheel or one of the throws of the crankshaft, and any movement of the shaft will be clearly indicated by that of the operating lever.

If the pistons have become worn and the cylinder bore is greater at those points of the piston travel where the side pressure against the cylinder wall due to connecting rod angularity has been greatest, a considerable side movement of the piston is possible, the resulting pound being very much the same as though a bearing was loose. Another very common cause of knocking is a carbon deposit in the combustion chamber which tends to produce early firing or preignition of the compressed charge. This condition is due to lubricating systems which deliver the oil in such copious quantities that portions of it work up past the piston rings and burn because of the intense heat of the explosion. The deposit becomes incandescent at certain points and explodes the gas before the electric spark which normally performs that function takes place. Another way in which carbon deposits may cause preignition is by reducing the compression space in a motor which normally has a high compression. An eighth of an inch deposit on the piston top and a corresponding amount in the cylinder head would decrease the compression space by a quarter-inch, and thus even a very slight variation from the normal condition might cause early ignition.

An uncommon cause of knocking is due to the flywheel loosening on its shaft, although the later methods of fastening make this an unusual occurrence. On many of the older engines the flywheel is secured to the shaft by a large Woodruff key, or a gib key. If this is not fitted with extreme care the flywheel loosens on its fastening and the reduction of width of the key or the augmented size of the keyway produces a certain amount of lost motion, which results in a pronounced knock every time the flywheel comes in contact with the key. Even when the flywheel is bolted to a flange forged integral with the crankshaft, there may have been some carelessness in fitting the retaining bolts or in machining the bolt holes, which would permit the fastening means to loosen and the flywheel to shake and thus cause a metallic knock.

Loose cams on the camshaft, loose timing gears and worn gear teeth often cause pounding. Deterioration of the valve-operating mechanism generally produces a rattle, though if strong valve springs are fitted any lost motion in the timing gears, cams, valve plungers and even in the valve stem guides will make pronounced knocks, which become greater at higher speeds. The camshaft bearings, when of the plain bushing type, may wear and the lost motion produce noise, while many of the minor bearing points, such as the small pins of the overhead valve mechanism, loose tappets and rocker arms, or looseness of the roller at the bottom of the valve-operating plunger will in the aggregate produce considerable rattle, especially at higher engine speeds and with strong valve seating springs.

A severe pound is sometimes traced to faulty motor bed

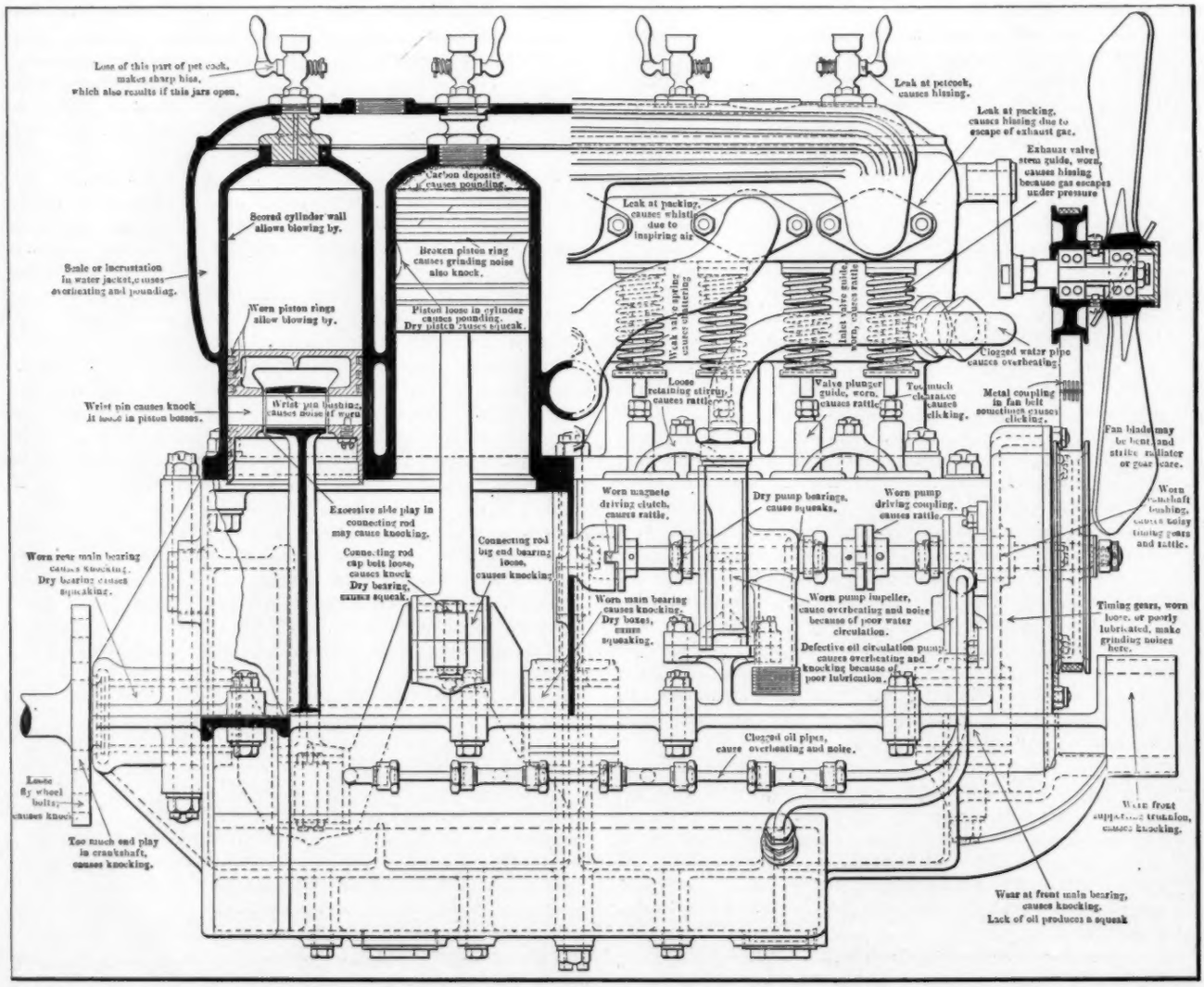
retaining bolts, which allow the crankcase to shake in the subframe or on the main side members. The shaking loose of the cylinder retaining bolts or nuts will cause a pronounced knock, and usually results in a broken cylinder flange if not promptly remedied. Sometimes a piston may be striking the end of the counterbore or shoulder left in some cylinders after machining; this condition often obtains when thin oil-retaining packings are inserted between the engine base and the cylinder flange instead of the thicker ones formerly used after an engine had been overhauled.

A bent or sprung crankshaft will impart a certain side shake to the connecting rod that will cause forcible contact between the sides of the wristpin bushing and the piston bosses during a certain portion of the revolution and bring the sides of the crankpin bearing against the crankwebs sharply enough to produce noise at other times. If there is considerable end motion of the crankshaft it may result in an irregular knock. The end of a connecting rod may hit a bolt or screw projecting into the case, or a connecting rod or main bearing cap or retaining screw become loosened enough to permit considerable play. A wristpin may be loose in the piston bosses, and there is always the possibility of some small parts, such as set screws, nuts, washers, split pins, etc., coming adrift and falling into the crankcase in such a position that some of the revolving parts will come in contact with them at times. In many engines of the single-cylinder type the counterweights fastened to the crank throw opposite the crankpin to balance the reciprocating parts may become loose on the retaining bolts and cause a severe knock. This condition demands immediate attention, for if one of the balance members becomes unfastened the crankcase is doomed.

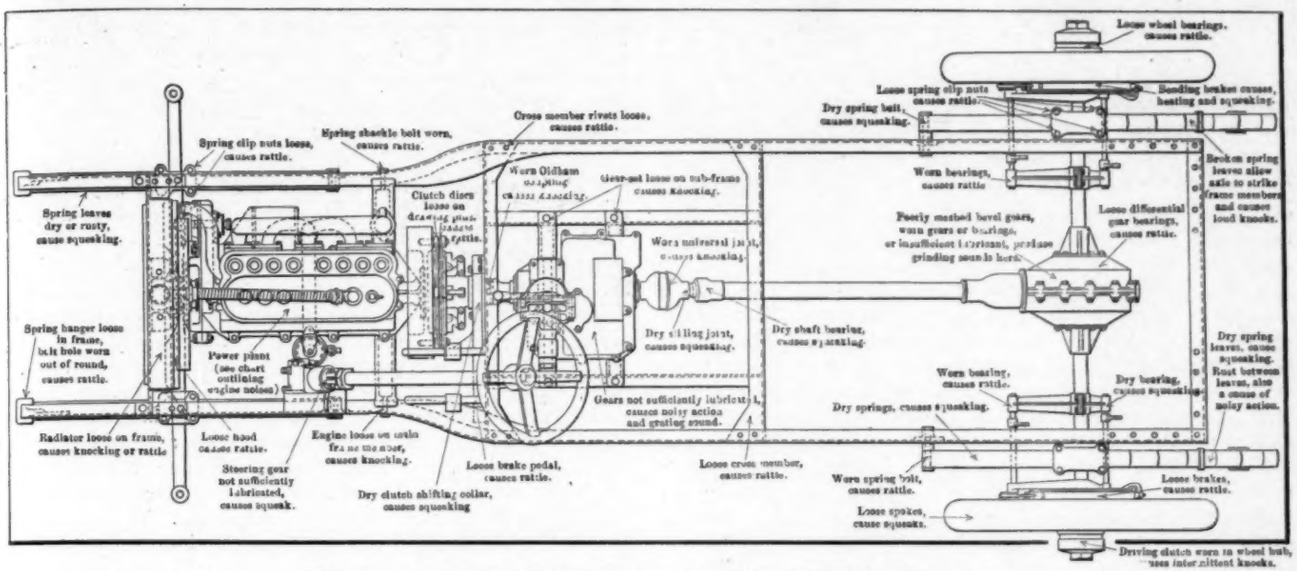
Sometimes, when the spark plugs are placed over the valves a long shell member may be inadvertently substituted for a shorter plug and a pronounced knock may result because of the contact of the valve head with the plug bushing. This should be avoided and care taken to use only plugs of proper length, because this forcible contact may spring the camshaft or bend the valve stem. A timing gear with worn teeth and loose upon its driving key may cause a combination of sounds that will lead one to believe that the end of the motor is near, while a broken ball or roller bearing will cause a combination knock and grinding noise that is hard to mistake for anything else.

Anything that will cause the motor to become excessively hot will produce a knock, and when overheating is due to poor oiling there will be squeaking or grinding noises denoting dry bearings as well. Failure of the cooling system will cause the motor to become so hot that the charge preignites and one has the same condition and sound as though the interior of the combustion chamber was full of carbon.

Another common sound that indicates faulty power plant action is a sharp hiss, and this can usually be traced to a leak in the cylinder above the piston top. The petcock used to relieve the compression and for priming may have jarred open, and it is not an uncommon occurrence for the shut-off valve part to drop out of the seat and allow the gas to escape. To remedy this



Longitudinal sectional view of a four-cylinder motor showing the relation of the various working parts with a view to the discovery and prevention of noises



Plan view of a chassis showing by means of notes the probable location of noises

a plug of wood may be made and driven in, or a repair extemporized out of a small bolt and a couple of washers if the missing part cannot be found in the under pan. A hiss may also be caused by a broken spark plug gasket or a faulty packing under one or more valve chamber caps, and a defective exhaust manifold gasket or lost retaining bolt that allows the gas to escape will also produce a hissing sound. A whistle is caused by escaping gas around a loose packing that acts as a reed. This sound may be produced either by inspiration or exhaust of gas and therefore any loose packing on either the inlet pipe, the exhaust gas conductor or the engine base may produce it. A small crack in either of the gas conductors will also produce a whistle—in the inlet pipe when air is drawn in at that point, at the exhaust when the inert gas is discharged through the very small opening. Leakage through worn inlet or exhaust valve stem guides will also cause hissing.

When a squeaking noise is heard look after the lubrication system. The main bearings may run dry, or the level of oil in the engine case may be so low that the interior of the engine is deprived of the oil necessary to insure smooth and continuous operation. Find out the cause of the squeak at once, for if bearings are run without proper lubrication they will burn out if of white metal or babbitt or seize and cut the shaft very badly if of bronze. Dry cylinders will become scored and the process of reboring that is necessary to restore their efficiency is much more costly than the price of oil enough to insure proper oiling for several years. Impurities in the oil may cause grinding sounds by getting between bearing surfaces, and parts that fit too tightly cause a grind or squeak even when they are copiously lubricated.

A wheezing and scraping sound may be traced to the flywheel scraping against a projecting piece of the underpan in contact with it. A slight clicking sound may be due to the fan blades striking the radiator. A broken wristpin will often cause both pounding and scraping sounds, the knock because of the lost motion in the bearing, the grinding sound because the end has worked out and is bearing against the cylinder wall.

A broken piston ring often causes a scraping sound, as does a stuck piston ring which cannot move in its groove because of carbon accumulations behind it which force it against the cylinder wall. A very sharp squeak has been traced to a dry contact blade in the timer or contact breaker of a magneto; a dull squeak has been finally located in the timing gear case, being produced by the rawhide shrouding of one of the large gears swelling out and coming in contact with the timing gear case cover.

Another intermittent knock and grinding noise is sometimes caused by the governor weights striking the timing gear case cover when the engine was suddenly accelerated, and remaining in contact with it when the engine was run at certain speeds. When the motor was running slowly the weights were held in position by the springs, but just as soon as the speed was increased the weights flew out against the cover and produced a knock, afterward grinding as long as the speed was maintained that kept them in contact with other metal. If the shifting collar of a clutch is not properly lubricated it will squeak in a very pronounced manner, while wear in the driving connection will cause a sharp knock every time the clutch is released or engaged, as well as every time the motor speed is changed or regularity of torque interrupted.

Gearsets are apt to be noisy after they have been in use for some time—the planetary type on the low speed and reverse ratio, the sliding gear forms on all speeds. The design of the planetary gearset and the high speeds at which the small gears revolve tend to make for noisy operation even when the gear is new, and this condition is augmented considerably when it has been in use for some time. If sliding gears are properly made and handled there will be no undue noise, but as soon as the gear teeth wear, however, and the shaft bearings lose their correct adjustment, the grinding on the lower speeds will be very objectionable and a certain amount of noise will obtain even on the high speed, as the lay shaft and main driving member gears are always in mesh. When the keys and splines wear so that the gears are not rigidly held to the shafts the noise due to the teeth being worn out of correct pitch will be intensified. If the bearings lose their adjustment or become worn, the center distance between the gears will be changed and noise result because of improper meshing. Metal particles in the lubricant often cause grinding, and unsuitable oil, or a lack of lubricant, may result in noisy operation even if the gears are not worn unduly.

In some types of selective gearsets the amount of sliding movement necessary to engage any of the gears is very slight, and but very little lost motion is required to permit the gears to come in contact at the tooth edges while out of engagement and cause grinding or an intermittent knocking. Examine the locking balls or spring-actuated plungers that keep the parts in place and prevent motion of the disengaged members and see that they are functioning properly. If annular ball bearings are used, they are liable to make a clicking noise if there is a damaged ball or broken separator and grind if there is foreign matter in the races. If bearings and gears appear to be in good condition and the lubricant has proper viscosity and is clean, and still there is an objectionable grinding noise on the lower speeds, it is possible that one of the shafts is sprung and the gears are not meshed properly at a certain portion of their revolving movement.

Chain drives, unless properly encased and lubricated, are apt to be noisy except when new, and even then there will be a "singing" sound at high speeds. The grit and oil that collect on exposed chains cause the links to wear out of pitch, and, as the sprockets depreciate at the same time, it is not long before the drive is quite noisy. If the sprocket teeth become hooked and the chains are adjusted too tight they will "snap," while if too loose the chains will "slap" as well as grind. The small driving sprockets on the countershaft sometimes become loose on their fastenings, and a knock very similar to that of a loose bearing is heard every time the continuity of the drive is interrupted.

A very common noise emanating from shaft-drive rear axles is a grinding sound, which often becomes greater at high vehicle speeds. This is usually due to wear of the bevel driving gears; deterioration of their supporting bearings; lack of proper lubricant; foreign matter in the oil and very often to poor adjustment. Bevel gears will produce a harsh grinding sound when meshed too close together, and, on the other hand, if not engaged sufficiently there will be a rattle. A very common cause of rattle is loosening of the driving means at the wheels, especially on full floating axles where the hub is driven by a jaw clutch attached to the end of the axle shaft. If these become worn so there is lost motion between the driving dogs and the slots machined to receive them, the play will be evidenced by knocking every time the continuity of drive is interfered with. On some of the lighter live axles the shafts are supported on plain cylindrical roller bearings which bear directly on soft steel shafts and in a soft steel tubing axle housing. These cut through into the shafts and also remove considerable metal from the tubing interior. When the play becomes great enough there will be a pronounced rattle whenever the car is driven over Belgian block pavement.

It is not uncommon to trace a squeak to a dragging brake band, usually one of the internal brakes which has become covered with a deep enough accumulation of dust or grit to keep in contact with the drum. Poorly adjusted brakes will also cause the same condition, but care should be taken not to have these members too loose or there will be a rattle instead of the squeak.

A loud knocking is often traced to worn universal joints, which have so much lost motion between the cross and the driving pins, and often between the yokes and the center member that the parts are brought into forcible contact with each other at every movement of the rear axle that causes even the slightest variation in driving shaft angle. This is especially true of unprotected universal joints, the dirt that works into the bearing surfaces causing rapid wear and considerable noise. In this connection it is well to call attention to the pronounced knocking, very much like a worm engine bearing, that results from driving torque or radius rods when they show wear at the points where they are fastened to the frame or axle.

Most of the components comprising the chassis assembly are held to the frame by bolts and nuts instead of rivets because of the necessity which sometimes arises for their removal for repairing. It is not infrequent that common machine and carriage bolts are used as fastenings, and as they loosen they naturally tend to produce a rattle. Rivets sometimes loosen and a subframe or cross-member supporting some heavy member such as the power plant or gearset becomes loose and produces noise.

The brake operating rods and various links of the control system are sometimes carried on the frame in such a way that they come in contact with the frame members and produce a rattle. Very often these are passed through holes in the frame members and squeak because of the dry metallic contact whenever they move longitudinally and rattle with every frame movement. Lost motion at spring shackles causes sounds that are not pleasing and dry springs produce squeaks that are distressing and very easily prevented. When spark-and-throttle control shafts pass through the center of the steering column, these may become rusted slightly or not have sufficient oil, and every time the steering wheel is turned or the engine speed varied a squeak is heard that is often hard to locate. Various points on the front axle may wear or get out of adjustment and produce their distinct little rattles that contribute to the general din. The tie-bar and drag-link yokes or ball joints may have considerable lost motion, the steering knuckles may be loose on the yoke pins and the ball bearings may be worn or out of adjustment.

Noises are sometimes located in queer places that one would never suspect. For instance, a pronounced squeak was found due to the opening of several of the joints on the sills of a wooden body after all points of the mechanism had been carefully gone over with an oil can. A knock that was searched for in vain in the engine was finally located at the gasoline tank, which was adrift on the frame; another that suggested loose connecting rod big ends was eventually discovered in the muffler, where a baffle plate had become loose on all its retaining rivets except one at the top, which permitted it to swing back and forth like a pendulum at every impulse of the motor, and thus produce a rhythmical knock usually attributed to a defective engine bearing. A dry water pump stuffing box produced a squeak, while a clicking noise that was searched for in vain for several days was discovered in the fan belt, which had a metal fastener that produced a little metallic knock every time it went over the fan pulley.

Every point where movement is possible should be well fitted and have a minimum of lost motion; the mechanism must be kept clear of the abrasives that work into the bearing points and produce untimely deterioration, and all joints, no matter how unimportant, should receive oil. All loose rods, wires and parts should be firmly fixed; every nut should have some kind of positive securing means to insure against loosening by vibration; pipes should be kept tight; broken packings and gaskets should be replaced as soon as they give evidence of leakage, and, above all, the engine bearings should be kept adjusted to that point where the power plant will be silent in action.

In the Fitting of the Top

One or Two Points That Are Generally Overlooked

George J. Mercer offers a few suggestions to the automobilist who desires a top fitted to his car, nor would it be out of place to observe that the top maker would be the proper authority to advise the owner to get a good top while he is about it.

WHAT the public sees when an automobile goes by is everything that intercepts the line of vision, including the soiled appearance of the fabric of a top, if the material used therein is of the class that picks up dirt and holds it in the mesh of the weave. What the owner of the automobile experiences includes a most unpleasant sensation if the top soils readily and belies the quality of the car despite effort. It is not uncommon to see fine examples of automobiles sporting tops that cost enough to be good, but it is a great misfortune that purchasers of automobiles put in too much time discussing the several phases of their ideals to the high disregard of the kind of material that is used in tops and of the fact that the ironing

of a car for the top is something to be given serious consideration, and referring to Fig. 3 of a side elevation of a top fitting on a fore-door type of automobile it is pointed out that the iron, if it is placed at E, is in exactly the right position to be struck against by the elbow when the driver of the automobile slides the gears or puts on the emergency brakes, and it is not too much to say that an interference of this character at a critical moment may be the foundation of a serious accident. But if the iron is placed at F instead of at E there is nothing to prevent the proper working of the top, and the occupants of the front seat will have a clear view of the surroundings without having to peek around an interfering member. Moreover, the idea of interference during the sliding of the gears or the working of the emergency brakes will be done away with.

Still another point that is sometimes overlooked is coupled with the idea that the head room D does not have to be so very much since it is customary to hold to a stooping position during the operation of getting into a car, but there is no reason why the diagonal support of the top should be so slanted as to interfere with the head room at the point G. It is certainly possible to so locate the iron H that the diagonal brace at the point G will come in the plane of the back sill of the rear side entrance.

In the three figures given there is ample opportunity to observe the relations as they hold between the side elevation, top and rear view. Success in the fitting of a top begins with the proper placing of the irons and referring to A and A′ in Fig. 1, the rear top irons are indicated, showing how they are fashioned to support the top when when it is folded down. At A the fabric is cut away and the iron is shown in its position far enough to the back so that the socket is level with the widest part of the seat trimming, measuring about 27 inches from the center line in this example, and referring to A′ at the right side of the body this iron is shown as H in Fig. 3, occupying the forward position, in which the distance from the center is approximately two inches greater than the same distance for the back irons. This increase in distance is due to the placing of the front irons H at the widest point of the body, and it is suggested that the body designer should have in mind the suitable location of the irons at the time of laying out the body.

Proper clearance should be given between the inside of the bow when down and the outside of the socket iron at A′, and experience seems to show that a distance of four inches will be sufficient, making the top clear at A′. In selecting tops for the various makes of automobiles the observance of a due measure of clearance may dictate the use of bent bows in some cases, but it is well to guard against the outward swelling of the bows too much, and here again there is opportunity for the designer of the body to settle the problem of the fitting of the top, avoiding tight situations, catering to appearance and utility at the same time.

There are two broad considerations that are present in the fitting of tops, one of which has to do with the top when it is up and the second point deals with the top when it is folded down. Strange to relate, most tops give trouble when they are in the folded-down position. This is due to the fact that the irons are not placed far enough back to carry the load without putting undue work upon the bows, and this difficulty is accentuated by selecting tops that are higher than there is any occasion for having them. The illustrations here given show by measurements indicated just what can be done in the matter of fixing clearances and arranging for the proper support of the weight, and if these matters are properly attended to the remaining considerations will have to do with the proper selection of the bows and the fashioning of the irons, having in mind the idea that the irons should be securely bolted to the frame of the body, and for the rest it is a mere matter of picking out a good grade of fabric that will match the outward appearance of the car, keep out the rain and resist dirt.

It would be a step in the right direction were it against the law as it is against honesty to apply false descriptions to the fabrics that are used in this class of work. It is marvelous what a large number of fabrics there are that are called mohair without due license. It is also true that the mohair used in many instances is too thin to do good work. The purchasers of automobiles should specify genuine mohair weighing about eight ounces to the yard, if this type of material is to be used in a top, and there is no reason why an Angora goat should be discriminated against by having imitation mohair foisted upon a purchaser simply because it is difficult to tell from appearance the difference between genuine mohair and "lustre wool." It is not the purpose here to contend that lustre wool fabric is too poor to use in a certain line of work, but it is proper to say that lustre wool fabric should not be sold to a purchaser as genuine mohair.

The main difference between genuine mohair fabric and that of wool is represented in the better life of the mohair, the greater protection it affords and the further fact that the hard wire-like thread of the mohair works into a fabric that will not hold dust, there being nothing for the dust particles to cling to. Beyond selecting the types of fabric that will afford the requisite protection and retain a good appearance for a long time there still remains the necessity of protecting the top against accumulations of dust by having the cover properly fitted, especially at the front end, and the idea that anyone should put up with a "baggy" looking affair as a substitute for a real top is too ridiculous for serious consideration.

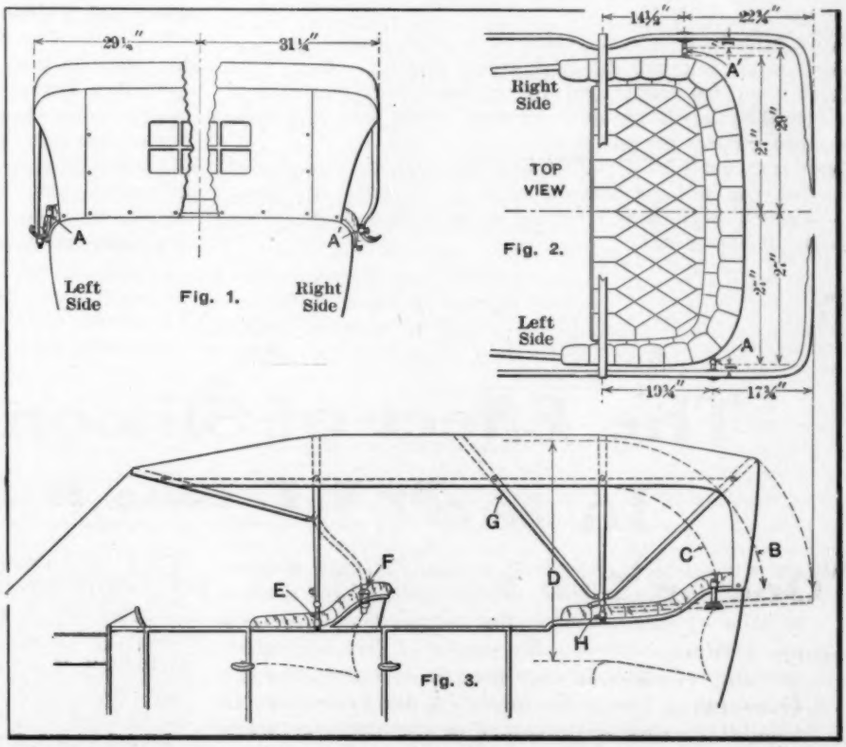


Fig. 1—Rear view of a properly fitted top showing the positions of the irons at the back and side
Fig. 2—Plan of the top showing clearances of the bows in the folded down position
Fig. 3—Side elevation of the top in the up position suggesting elbow clearance by placing the iron at the front seat far enough back to properly serve the purpose

When Judgment Whispers Don't

DON'T overlook the damaging effect of extreme conditions of heat upon rubber tires.

DON'T drive too fast on a hot day; even automobiles experience a depressing effect if the weather is warm.

DON'T stand the automobile exposed to the blazing heat of the sun; it will blister the finish.

DON'T use light body lubricating oil if it must resist the heat of a Summer's day and do its work besides.

DON'T overlook the sensitiveness of a machine to heat and cold; expansive effects must be taken into account.

DON'T tax the adroitness of a good automobile in the production of dust to the annoyance of an antagonist.

DON'T try to make your neighbor eat dust; if you think it is a healthy diet take your fill of it.

DON'T interpret liberty as meaning that you have the right to practice the artifices of a road-hog.

DON'T pass a brother automobilist on the road if he gives a distress signal; you can well afford to stop and see what he wants.

DON'T annoy the blue-coated guardian of the peace; he will not care to sprint as fast as your automobile may be forced to go.

DON'T practice antagonism when the weather is warm; the judge might give you a limit fine.

DON'T miss the opportunity to splash water on the tires if the day is hot; it will cool them off and add materially to their stamina.

DON'T embarrass the motor by running on a retarded spark; the radiator will catch the disorder also if this practice is indulged in.

DON'T poke fun at a brother automobilist if you catch him trying to pump up a tire with a toy pump.

DON'T attempt to crank an overheated motor without approaching it in due and diplomatic form.

DON'T crank with the right hand if you can do the work with the left.

DON'T push down upon the crank—it is safer to pull up.

DON'T forget to retard the spark before cranking.

DON'T count too much upon the unconstitutional features of bungling legislation—your curiosity might cost you more than a dollar per pound.

DON'T start out with a pint of lubricating oil and the promise that you will get some more at a convenient garage—a burned-out crankshaft bearing might greet you before you get to the garage.

DON'T forget that the police interpret the law, and also decide its fine points.

DON'T employ the languid method of cranking a motor—it might get mad and inject some ginger into you.

Antipodean Automobiling

Australian motorists are much interested in the question of self-starters, several new systems having been evolved during the past year. The automobile is an aid in opening up the country. Australia affords touring ground which in point of interest and scenic beauty is second to none in the world.

AUSTRALIA is manifesting deep interest in what automobilists term "the direction of the self-starting motorcar engine," as revealed by the introduction of several new systems evolved during the past year. The engines include methods for compressing carbureted gas into the cylinders by artificial means, in order to secure an initial charge; methods of forcing the engine to turn past one or two firing points by means of compressed air, and also methods purely mechanical in their nature.

There is an estate of many thousand acres of wild and wooded, roadless land in Australia, whose owner has just received ten automobiles from England. He had these machines constructed after his own designs. These contained numerous stipulations, especially these: The machines were required to be equipped with gears for stationary work; be provided with a winch for hoisting or pulling them out of soft ground; have a sufficient clearance to negotiate several feet depth of water; and be capable of going at a reasonable speed.

The Upper Murray Mountain in Australia affords innumerable attractions for automobilists, rugged, ragged and danger-wrought though this mountain is. The route is from Wodonga to Talgarno, passing through Jingellic, Walwa, Tintaldra, Gorryong, Wabba, Berringama, Koetong and Tallangatta. Not alone Australians, but also around-the-world tourists take advantage of this wild, romantic, mountainous highway, many parts of which have been rebuilt expressly for automobile travel.

The Motor Car Act now in force in Melbourne carries with it the obligation that each driver's license shall bear the endorsement of a Police Court Magistrate on the reverse side. One captious critic, chafing under what he declares to be an unfair custom, says that "licenses thus disfigured are standing evidence, as far as they apply against the efficiency of the holders, as motor car drivers, who even were they nominally at fault in the first instance may now be ranked among the experienced and most careful drivers."

The Effect of Silicon on Steel

By E. F. Lake, M. E.

Silicon in steel is as beneficial in its effects as silicates are undesirable, and this article treats of the correct method of incorporating the metalloid in steel and of repelling silicates. By means of this ingredient corrosity of iron and steel may be overcome and the formation of blow-holes thwarted, but a considerable amount of care is necessary in the manufacturing of siliceous steel using either silicon or its alloys with iron and manganese in exact proportion in order to avoid destroying the good qualities of silicon steel.

THE wide application of silicon was only begun when the electric furnace made it possible to obtain ferro-silicons that were rich in silicon. The importance of this metalloid in metallurgy has shown a steady increase since that time, in that its addition to iron, steel, aluminum and so forth has proved to be very beneficial, and doubtless other benefits from its use will be discovered in the future.

Silicon forms 27.21 per cent. of the earth's crust and is the second most important element, oxygen being first. As it has a great affinity for oxygen it occurs chiefly in the form of silicon dioxide, SiO_2, which is commonly called silica. It is never found

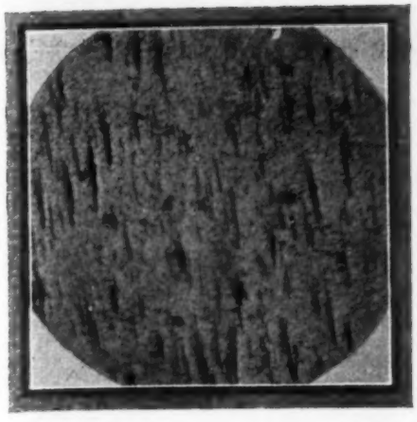


Fig. 1—Fibrous structure of silicon steel, magnitude 300 diameters

in the free state in nature, but besides the silicon dioxides forms silicates in combination with oxygen and some metallic elements. Silica neutralizes every base it comes in contact with when molten, and all metallurgical slags are the silicates thus formed. For steel making the silicon has to be separated from the oxygen of the silica and united with iron to form ferro-silicon.

Silicon is a non-magnetic metalloid, while iron constitutes the typical magnetic metal. Each increase in the percentage of silicon that is added to iron decreases its magnetic attraction. When the silicon reaches a high percentage it makes iron practically non-corrosive and thus it has been possible to use irons containing from 15 to 20 per cent. of silicon in the construction of drainage pumps such as are used around salt water, and also for the bilge pumps of ships. At these high percentages there is a distinct antagonism between the silicon and carbon and each increase in the silicon's percentage is accompanied by a diminution of that of the carbon. With this decrease of the carbon numerous cavities are formed that are filled with the graphite dissolved from the carbon in the iron during fusion. The carbon is subsequently almost entirely separated while the metal is cooling.

The effect of silicon on steel is not yet thoroughly understood. When Bessemer steel has silicon left in it, it indicates that the metal had been blown too hot. Such metal is apt to be brittle. To get the best results in steel the silicon should be eliminated as much as possible when purifying the bath and the definite quantity required should be added in the form of ferro-silicon or ferro-manganese-silicon. This gives a much different effect from that of silicon left in during the process of manufacture. When silicon is added to steel in a manner that will cause it to enter into solution as silicide, it confers upon the metal valuable properties, but when it forms a silicate it is injurious in many ways, even to the point of being dangerous. This occurs as the silicates of iron, manganese, etc., but these usually dissolve into each other and go off into the slag; although manganese-silicate probably causes more failures in the steel than is generally supposed.

Silicon is one of the best elements with which to prevent the formation of blow-holes in steel, as it has a great affinity for oxygen and seizes this wherever found whether in the form of gases, oxides or dissolved oxygen, and carries it off into the slag. It thus makes the steel harder and tougher and better able to withstand wear and crushing from continual pounding. One steel maker discovered that if the percentage of manganese plus 5.2 times the percentage of silicon was made to equal 2.05, the metal would be entirely free from blow-holes, but the pipe would be large. If the total was made to equal 1.66 per cent. the pipe would be smaller and numerous minute blow-holes would appear, but not enough to harm the steel for most uses. It was also found that 0.0184 per cent. of aluminum would have the same effects as 1.66 per cent. of manganese and silicon.

In the Bessemer converters silicon increases the temperature of the bath and hence a pig iron that is low in silicon will cause the blow to be shorter than if it were high. At the end of the blow 0.2 per cent. of silicon is added to rid the bath of gases. In the crucible process the steel absorbs silicon during the "killing" and thus becomes sound by throwing off the gases. Too long "killing" makes the steel brittle, owing to its absorbing too much silicon, the graphite crucibles usually used in this country give up more silicon than clay crucibles, and for this reason allowances have to be made when charging.

When quenching steel the influence of silicon is similar to that of carbon in many ways. To some extent it neutralizes the injurious tendencies of manganese. The resistance to shock of silicon steels in the direction of lamination is remarkable owing to their extremely fibrous formation. They have practically no resistance, however, in a direction perpendicular to the laminations. They are thus especially adaptable to the manufacture of leaf springs. This fibrous formation gives the appearances that are shown in Figs. 1 and 2 when the steel is examined under the microscope.

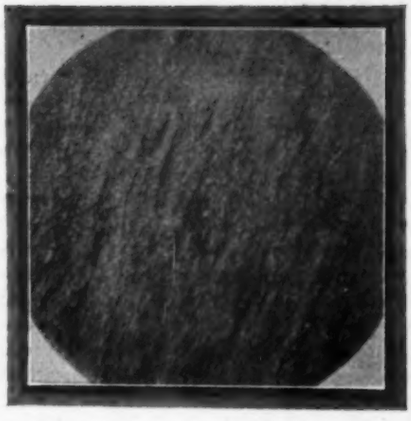


Fig. 2—Fibrous structure of silicon steel, magnitude 300 diameters

Up to about 4 per cent. of silicon each increase in the percentage of silicon in steel slightly raises the tensile strength and lowers the elongation and reduction of area. The tensile strength increases about 80 pounds per square inch for each 0.01 per cent. of silicon, but beyond 4 per cent. a weakening seems to take place unless the manganese is high. Silicon steels will show very low shock resistance whether annealed or quenched, unless they have a high manganese content. With a silicon content of 0.20 per cent. the tensile strength is increased about one-third more than it would be with 0.01 per cent. of carbon.

With few exceptions the steels that are now used in automobile construction contain from 0.10 to 0.30 per cent. of silicon. In place of carbonized gears commonly used in the transmission case, a few motor car builders used a silico-manganese steel that contained about 2 per cent. of silicon, 0.70 per cent. of manganese and 0.50 per cent. of carbon, with the phosphorus and sulphur below 0.40 per cent.

Hard tool steels that contained slightly less than 1 per cent. of carbon have been made with from 1 to 2 per cent. of silicon and these have been used quite successfully. Steels have also been made for several purposes that had a silicon content as high as 5 per cent. With a silicon content higher than this steels have found very little use. When the silicon content is below 1 per cent. silicon ceases to have an influence on quenching and the magnetic property of iron is not decreased to any appreciable amount, hence such steels are not mentioned as silicon steels.

Pointers Concerning Acetylene Lamps—Copper tubing is considerably used for piping acetylene gas to the burners, but it is liable to erosion by the gas, and standard 1-8-inch gas pipe is better and lasts longer. The gas bag and rubber lamp connections should be kept clean and not painted, as is often done to correspond with the car, as paint rots the rubber, with the result that it is soon unserviceable and must be replaced. When the rubber is to be washed, only water should be used and it should be carefully dried before putting in service again.

How Car Owners May "Turn an Honest Penny"—Some enthusiastic English people are in favor of devoting the automobile to a unique use, as an endorsement of the proposition of "a lady in reduced circumstances," namely, to put her own private car at the disposal of parties desirous of attending at-homes and after-theater parties. Of course, such obliging service would be done "for a consideration."

Axle Shows Signs of Sagging

Editor THE AUTOMOBILE:

[2,735]—I noticed a sketch in your paper recently with reference to axle sagging, and it tallies with some trouble I have had. The rear wheels do not run true and it seems that the casing has taken a slight set. Would it be possible to put the matter right by fitting a tie rod? How is this attached?

The method of attaching the tie rod is shown in Fig. 1. A bracket must be fitted to the casing C′ and the tie rod slipped through the hole and a nut N fitted each side of the bracket holding the rod in tension. Even when these rods are fitted drivers do not make proper use of them. Owing to the bending strain that is imposed on the metal it tends to stretch slightly and this must be taken up in the adjustment. In most cars provision is made for the attachment, but in case it has to be fitted afterward the bracket may be made in two halves and bolted over the casing C′. In addition it should be soldered or brazed.

A Most Unpromising Undertaking Indeed

Editor THE AUTOMOBILE:

[2,736]—Will you please tell me who is the best party to weld a crankshaft?

M. G. JOLES.

Oneonta, N. Y.

Considering the fact that the crankshaft broke in service, if it did, remembering also that a welded section is never as strong as an original section, we fail to see any promise in an undertaking such as this. It might be more to the point to get a new crankshaft.

Put a Baffle Plate at the Open End of the Cylinder

Editor THE AUTOMOBILE:

[2,737]—At times the right cylinder on my 12-horsepower horizontal opposed offset motor sucks in so much oil that the spark plugs foul up every mile or two. Sometimes it will run 100 miles without a particle of trouble, then again will bother for a week and seems to right itself. I clean the cylinders thoroughly very often. Oiling system is automatic splash, amount of oil in tank seems to make no difference. Can you suggest any way out of the difficulty? PERPLEXED.

Worcester, N. Y.

Horizontal types of motors sometimes give trouble of the type as complained of by you, and it is not unusual to fit baffle plates at the open ends of the cylinders, these plates being of sheet iron or aluminum flanged to the diameter of the cylinder with a slot cut across the disc of a size that will permit of the play of the connecting rod. The fitting of a plate of this character is not a difficult undertaking, and it has the advantage of being the certain cure for the disorder.

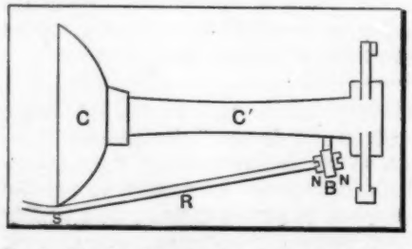


Fig. 1—Showing how the tie rod is attached to the axle to prevent the same from sagging

Method of Replacing Ball Sockets

Editor THE AUTOMOBILE:

[2,738]—I find that the ball socket of the steering arm of my car has worn considerably. Can I have this replaced without having a whole new part made? The car is not a modern one and I am afraid I shall have some difficulty in obtaining a new part even if I wanted one. ANCIENT.

Norristown, Pa.

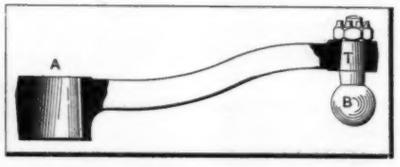


Fig. 2—Showing how a new ball joint can be fitted to replace a worn one

The method shown in Fig. 2 of attaching the ball socket should answer your purpose. It will be noticed that this part represents the drop arm of the steering gear and that the end is made large enough to drill and fit a taper bolt T with a ball B attached turned out of the solid.

After the part has been fitted it should be case-hardened. The wear you complain about was probably due to the old one not being properly hardened. The joint should be covered with a leather boot filled with grease.

Wants Information on a Variety of Subjects

Editor THE AUTOMOBILE:

[2,739]—Please answer the following questions through "Letters."

1. In what year did the Franklin engine contain concentric valves?

2. What are the objections to this type of valve?

3. How many Gordon Bennett cup races were run and what cars and drivers represented America?

What Some Subscribers Want to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith.

4. What is the horsepower of the Only car? SUBSCRIBER.

Topeka, Kans.

1. Last year.

2. Nothing.

3. Years 1899, 1900, 1901, 1903, 1904 and 1905.

4. We have no record of a horsepower test of this car.

A Paste Called "Smooth-on" Will Help You Out

Editor THE AUTOMOBILE:

[2,740]—There are two small cracks in the water jackets on the third and fourth cylinders of my car, through which the water leaks slightly. How can I remedy this? I certainly will appreciate it if you will answer this question in your next issue. TROUBLE.

Lancaster, Pa.

For many years in foundries and like establishments it has been the practice to mix finely powdered gray iron with chloride of ammonia (sal-ammoniac) to form a paste, which, when applied to metallic surfaces hardens and after a few hours this paste assumes all the characteristics of cast gray iron, of which the cylinders are also made. If you will get a can of "smooth-on" and apply it agreeable to the directions supplied therewith, it will probably lift you out of your present dilemma.

Method of Withdrawing Jackshafts

Editor THE AUTOMOBILE:

[2,741]—Could you tell me how to withdraw the jackshaft from my rear wheel without taking the wheel off every time? The flange of the hub is extended out and the hub cap fits on to it. L. W. L.

Atlanta, Ga.

We should suggest you having the end of the shaft drilled and tapped to take an extracting tool similar to the one shown in Fig 3. By means of this it is possible to

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith.

withdraw the shaft without difficulty. It may happen that in the fitting in the shops there are some marks on one of the teeth that engages with the hub forming the driving member and these should be looked for so that they may be replaced in the manner intended by the makers.

A Trio of Questions

Editor THE AUTOMOBILE:

[2,742]—I would like to ask the following questions through your valuable columns:

(1) What motor is used in the "Mercer" car manufactured by the Mercer Automobile Company of Trenton, N. J.?

(2) What manufacturer was the first to market a six-cylinder automobile?

(3) What cars did the "Correja" defeat in last year's hill climbs?

Newark, N. J. M. H. POTTER.

1. The motor in the Mercer car is of the continental make in Model C, and Mercer make in the M "30."

2. The Stevens-Duryea was probably the first six-cylinder motor.

3. We do not discover a record such as you are in search of as made by the Correja car.

What Make of Rear Axle

Editor THE AUTOMOBILE:

[2,743]—Being a subscriber to your journal I take the liberty of asking with what make of rear axle is my car equipped. I have noticed that the same make is used on the Halladay, Auburn, Parry and former Overland Six. D. M. ERSKINE.

Ambia, Ind.

The Halladay car is equipped with a rear axle made by The A. I. Smith Company, Milwaukee, Wis.

Another Case of "Too Much Heat"

Editor THE AUTOMOBILE:

[2,744]—I have been having trouble with the engine on my Maxwell 30 and will appreciate it very much if you can enlighten me on the subject.

A few weeks ago I noticed that it heated up very easily and finally stopped running. On examination I found that the condenser (the car is fitted with a Splitdorf magneto and coil) had played out. I returned the condenser to the factory and had it repaired, but on placing it on the engine found that it heated up as badly as it did before. I then thought there was carbon in the cylinders and used a decarbonizer in them very freely, but it still heats up.

Arvonia, Va. E. E. ROBERTS.

If you are sure that the lubrication is sufficient and that the ignition system is now in proper order try reducing the supply of gasoline to the carbureter, the mixture perhaps being too rich.

Belt Dressing Has Been Used in the Past

Editor THE AUTOMOBILE:

[2,745]—I am a subscriber to your magazine and read everything carefully. I there-

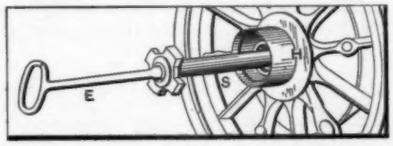


Fig. 3—Showing how the jackshafts can be withdrawn from a full floating axle and the style of tool used for the purpose

fore take the liberty of asking you for a little space in your columns, as I have never found anything about a friction drive. I wish to ask you whether there is any powder or other substance which can be put on the fiber wheel to prevent it from slipping when there is a hard pull at the start. I enclose herewith cut of the fiber wheel. Could this be changed to a shaft drive without incurring a very high expense?

WM. WIEMAR.

Belleville, Ill.

It might be a good idea to drill a lot of holes around the periphery of the disc and insert cork in these holes for the purpose of increasing the friction coefficient sufficiently to accomplish the desired end. It would be a simple matter to drill a series of ½-inch holes around the periphery of the wheel, centering these holes from ⅜ to ⅞ of an inch apart, and the cork inserts might be ⅝ inch in diameter, so that when they are compressed into the ½-inch holes they will remain there, excepting that the surfaces will protrude out slightly, serving as the friction members. Still another plan that might be worth trying, since it is simple and inexpensive, is to take a piece of high-grade linoleum, reducing its thickness to perhaps 1/16 of an inch or slightly more, and fasten it to the periphery of the

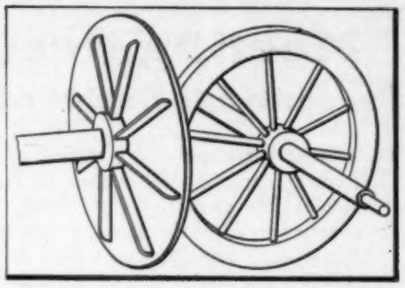


Fig. 4—Method of transmitting power from the flat disc to the fiber-covered friction wheel

wheel, using it as the friction member. It might be a little difficult to get this material to adhere to the wheel tenaciously for a long time, but it should be made to serve the purpose, unless you wish to go to the greater pains of using the cork inserts. Perhaps the National Brake & Clutch Company, of Boston, Mass., which concern deals in cork inserts, might be willing to suggest a method of using them under your conditions that will take you out of trouble. It would be a serious matter to undertake to rebuild the car with the idea uppermost of turning it into a shaft drive.

Brake Adjustments Made Easy

Editor THE AUTOMOBILE:

[2,746]—I noticed in recent issue of THE AUTOMOBILE on page 1121 that you described a good method of operating the brakes in the rear wheels. I have had this fitted to my car and it works very well and is a good equalizer. I live in a hilly district and have occasion to tighten the brakes frequently and will trespass on your space. Could you give me a sketch of a method of adjusting the brakes other than that shown in the illustration referred to? Something that can be done by hand if possible by lifting the floor boards. BERKSITE.

Reading, Pa.

No doubt you will find what you require if you will refer to Fig 5. In this illustration it will be seen that the brake lever arm is in the center of the chassis and the thumb nut on the end of the threaded rod is all that needs turning. The spring interposed between the arm and the locking nut holds the rod in place, prevents rattling and keeps a continual tension on the thumb nut, which would otherwise have to be fitted with a locking device.

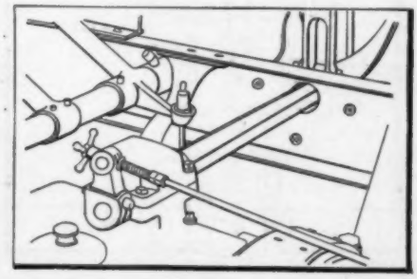


Fig. 5—Method of making a brake adjustment that can be easily tightened

Meeting Recurring Troubles

Presenting a Series of the Most Probable Cases

A series of correlated short stories, accompanied by diagrams and characteristic illustrations, including the nature of the troubles that are most likely to happen to automobiles, discussing their causes and effects, all for the purpose of arriving at a remedy. It is the aim, for the most part, to show how these troubles may be permanently remedied, and as a secondary enterprise it is indicated how the automobilist can make a temporary repair, thereby enabling him to defer the making of a permanent repair until a convenient time arrives.

LUBRICATION OF THE HUPMOBILE MOTORS—The oil supply reservoir of the Hupmobile motor is located near the top of the right-hand side of the cylinders, the upper part of the tank and the cylinders being on the same level. The tank is filled through a filler hole on the top which is covered by a screw cap. There is a gauze screen in the filler opening so as to remove all foreign matter and prevent it from entering the tank.

In the tank box there are two needle valves which, when closed, prevent the oil from flowing from the reservoir. A spiral spring on each of these valves holds them down on their seats. The seats are beveled perpendicularly to the bevel on the valve stem and this, acting in conjunction with the pressure exerted by the spring, gives an oil-tight fit. The valves are lifted by an arrangement of rods and levers from the same rocker arm as the throttle. A projection on the throttle rod performs the office of a cam and is arranged so that the farther the throttle is opened, the higher the oil valves are lifted.

When the needle valves are opened the oil flows by gravity through the two oil leads which are located in the bottom of the oil tank. The oil leads take the oil to the crankcase which is divided into two parts by the central main bearing.

The oil fills the bottom of the crankcase on each side of the division in the center to such a height that the bottoms of the connecting rods will dip deep enough into the oil to form an adequate splash. So that the oil can not accumulate above the designed level, there is a stand pipe provided in each division of the crankcase, located between the front and rear pair of connecting rods respectively. Since the stand pipes are left open the oil, after it has reached the level of the top of them, will drain through. A drain cock, which, when running should be left closed, is situated under each stand pipe.

When the connecting rods dip into the oil, even if the car is running slowly, a heavy oil vapor will be generated which will pervade the entire crankcase and lubricate the cylinder walls, connecting rod bearings, cams, cam shaft bearings and the main bearings. After passing through the rear main bearing the oil flows into the gearcase and clutch housing and lubricates the moving parts therein. On the gearcase and clutch housing at the rear of the motor, there is a level cock and a drain plug in the bottom. The crankcase is also provided with drain plugs besides the stand pipe cocks already spoken of. There is a level glass in the reservoir-box at the rear end. Another point to note is that there is about one-sixteenth of an inch clearance on either side of the wrist pin to permit a free access of oil to this bearing.

The differentials, universal joints and rear axle housings are packed in grease. The rear axles are equipped with babbit bearings, to prevent the oil from leaking into the brakes.

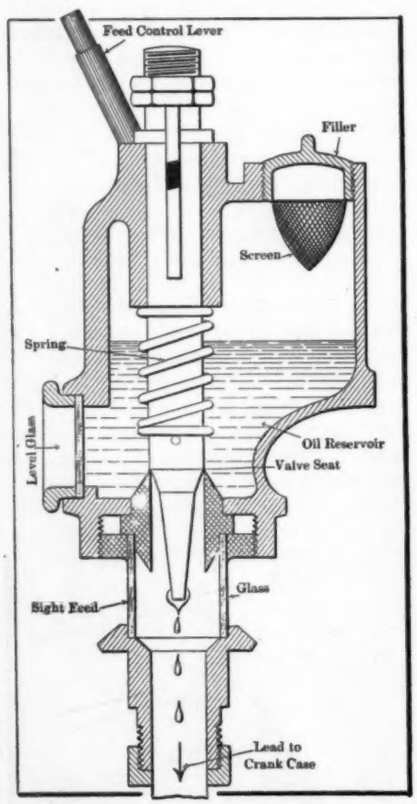


Fig. 1—Section showing the drop feed and oil tank on the Hupmobile

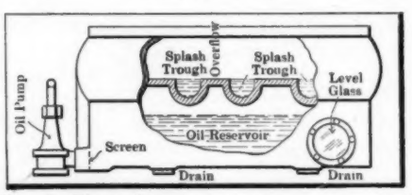


Fig. 2—Illustrating the oil reservoir and splash troughs on the Haynes car

HAYNES LUBRICATING SCHEME IN DETAIL—The oil reservoir of the Haynes Model 20 car is located in the lower part of the crankcase. Its capacity is about one and one-half gallons. The oil is put into the tank through the breather pipe which contains a screen. The cover to the breather pipe is lifted off, thereby exposing the filler opening.

The oil is taken from the reservoir by an external gear pump which is driven off the camshaft by means of gearing. The pump is located at the rear end of the base on the right-hand side. There is a sight-feed located on the dash.

After leaving the sight-feed the oil flows down into the crankcase by means of a pipe which subdivides into two leads in the base of the motor. These two leads on the opposite sides of the motor are on the same level with one another and also on a level with a series of oil troughs which are placed inside the crankcase.

The connecting rods beat the oil in the troughs into a spray which lubricates the cylinder walls, connecting rod bearings, main bearings and the camshaft. After lubricating these bearings the oil will drain back to the troughs which are constantly being supplied with more oil by the two ducts on either side of the oil trough, one coming from each main lead from the pump. To take care of the overflow there is a drain hole between each pair of splash troughs. There are four of these splash troughs and two drains. As the oil overflows constantly there is always a stream of oil passing through the drains back into the reservoir, replenishing the supply here.

So as to allow the pump to get the last drop of oil that it is possible to give it the casting has been dropped a little at the rear end near the pump suction pipe, thus forming an oil pocket. There is a strainer placed in the pump suction lead which will ensure a clean supply of oil to the bearings. It is very important that this strainer should be kept clean and it is therefore advisable to remove and clean it occasionally.

The amount of oil in the tank may be readily determined by means of a four-inch gauge glass which is located on the front end of the crankcase on the right-hand side. A test cock at the correct level forms a sort of auxiliary gauge. The crankcase is also equipped with drain plugs.

CUNNINGHAM CARS USE SPLASH AND FORCE-FEED—The Cunningham Model H car is lubricated by both the force feed and splash systems. The oil is carried in the lower part of the base or oil pan casting of the engine. This casting is made with a type of double bottom. The upper bottom carries a set of oil troughs for the splash system, while in the lower bottom the reserve supply of oil is carried.

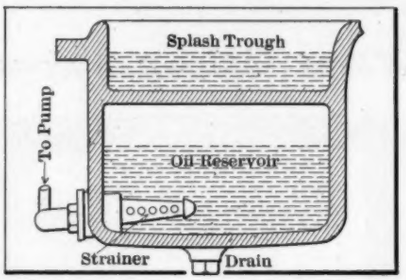


Fig. 3—Cunningham model H crankcase showing lead to pump

The shape of this oil tank is merely a plain basin although it is somewhat deeper near the rear end.

The oil is picked up out of this tank by means of a gear pump. The pump is driven from the camshaft by means of spiral gears. The suction pipe leads down into the reservoir and at the end is supplied with a strainer. The oil is drawn up to the pump, from which it is driven both through the sight feed and the main oil lead. The amount passing through the sight feed bears a definite ratio to the total amount which circulates through the system; as the sight feed lead forms a sort of by-pass to the main lead. The proportion passing to the sight feed may be altered by means of a regulating valve on the sight feed lead at the rear of the motor on the left-hand side.

The rest of the oil from the pump goes to the main lead which consists of a hole drilled longitudinally through the entire length of the aluminum crankcase casting. At each main bearing a lead is drilled through the aluminum to the main lead, which is on one side of the casting, connecting this and the main bearing web. Another lead is then drilled down through the main bearing web into the casing, thus lubricating the main bearing. The oil then overflows out of both sides of the main bearing casing into the splash troughs.

The scoops on the bottom of each connecting rod pick the oil and churn it into a flying spray, which amply lubricates the cylinder walls and connecting rod bearings as well as the camshaft bearings. The wrist pin is hollow and open at both sides. When the oil in the splash troughs overflows it drains back by means of overflow holes into the oil reservoir, from where it is again picked up and passed through the system.

There is a brass level gauge on the left-hand side of the crankcase showing the amount of oil present in the reservoir; the total capacity of the reservoir being about three gallons. The filler hole is screened.

Other bearings on the car are equipped with grease cups while the transmission and differentials are packed in oil and grease.

LUBRICATING POPE-HARTFORD ENGINES—The lower half of the crankcase of the Pope-Hartford engine is cast so as to form an oil reservoir in the bottom. Above this reservoir there is a sort of tray carrying a series of troughs, one for each cylinder, which carry the oil for the splash system. The walls of these troughs are at such a height that if the oil is on a level with the top of the wall, the bottom of the connecting rod will dip deep enough to form an efficient splash. If the oil should overflow the walls it will pass into the bottom of the base casting.

The oil is drawn from the reservoir up into a mechanical oiler located on the side of the engine base. Before entering the mechanical force feed box the oil passes through a sight feed. From the box there is a series of tubes running to the various cylinders, each tube being provided with a small plunger pump. These pumps take the oil out of the box, through a sight-feed and, from there, to the walls of each cylinder. The oil, after having lubricated the cylinder walls, will drain back to the crankcase.

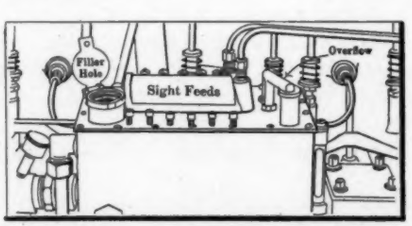


Fig. 4—Mechanical oiler of the Pope-Hartford car

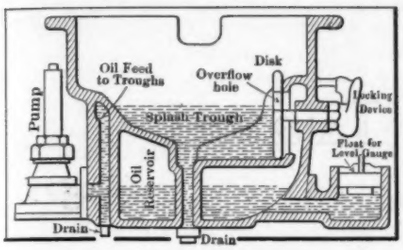


Fig. 5—Sectional view of the Pullman crankcase showing the oil channels and drains

The cylinder walls are also lubricated by the splash of the connecting rods into the oil troughs.

The mechanical oiler is driven by a shaft operated from the crankshaft. The shaft passes directly through the oiler driving not only that but also the water pump and magneto. Each lead in the mechanical oiler is equipped with a sight-feed located on the top of the oiler box so that it is easy to detect the location of any trouble in the system. A gauge glass is fitted on the dash showing the level of the oil in the force-feed box. When it is required to ascertain the amount of oil in the reservoir it can be done by means of two test cocks located on the side of the crankcase, the upper test cock being at the maximum permissible level, while the lower is at the minimum.

The oil is pumped up by means of the suction pipe from the crankcase much faster than it is used in the leads to the cylinder walls; hence there is always an overflow passing through an overflow pipe in the force feed box. This overflow pipe leads into the camshaft housing thus lubricating the cams, cam followers and the bearings connected with the camshaft. The excess oil drains through the overflow pipes and filter screens back into the reservoir. There is also a lead from the mechanical oiler to the gear case in the front of the engine. Otherwise these gears may be packed in grease. The other gears are oiled by splash from the crankcase.

The transmission and differentials run in oil and in their housings are located test cocks showing the level of the oil. Compression grease cups are located on the other bearings such as the clutch, universal joints, axle bearings, steering gear bearings and the oscillating spring bearings.

PULLMAN CARS OILING SYSTEM—Pullman cars are lubricated by the splash system. The crankcase is molded so as to have a double bottom. The inner bottom carries a set of splash troughs, one under each cylinder, which form the basis of the system of lubrication. Below this inner bottom is the oil reservoir, which takes in the whole lower part of the crankcase.

The reservoir is filled through an opening in the front left-hand crankcase supporting arm. The amount of oil present in the reservoir is determined by means of a level gauge glass located on the left-hand side of the motor between the two middle cylinders.

The rotary oil pump is located at the rear end of the crankcase on the left-hand side. It is driven off the camshaft by means of gears and a vertical shaft. This pump takes the oil from the rear end of the crankcase reservoir and sends it up into the splash troughs.

The connecting rods splash violently into the oil contained in these splash troughs at each revolution of the motor and beat the oil into a heavy vapor or mist which pervades the whole crankcase and amply lubricates the bearings contained therein.

The oil is continually being supplied to the motor much faster than it is being used and the overflow is taken care of by means of an overflow hole in a disk which is located in each splash chamber. This disk is able to rotate about its axis and in this manner raises or lowers the overflow hole which, of course, is not concentric with the disk. To keep the overflow level to its correct adjustment there is a locking device on the outside of the crankcase.

To prevent the oil from leaking past the end of the crankcase a centrifugal oil ring is hung on the end of the shaft. The oil is caught up by this ring as it drains toward the outside of the crankcase and is thrown by centrifugal force off the ring to the sloping bottom of the crankcase down which it drains to the reservoir.

The oil may be drained from the splash troughs by means of drain pipes which take the oil from the bottom of the troughs and allow it to flow from the bottom of the crankcase. The reservoir itself is also equipped with drain plugs, both front and rear, so that it may be completely flushed out and cleaned.

There is also a drain under the passage through which the oil flows on its way from the pump to the splash troughs.

The other bearings all over the car are taken care of in the usual manner; and the differentials and transmission are packed in oil and grease.

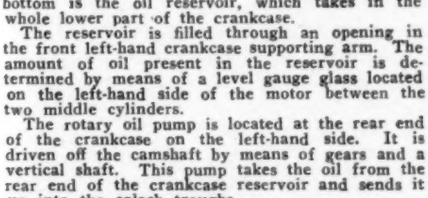


Fig. 6—The oil reservoir of the Mercer "30 M" showing level gauge and pump chamber

COMBINATION OILING SCHEME ON MERCER "30"—The Mercer "30 M." is lubricated by a combination of the splash and force-feed systems, the force-feed part of the combination forming the primary method of lubrication.

About two gallons of oil are carried in the lower part of the base casting. This casting is divided so that while the lower part forms the oil carrying tank there is a moulded sort of tray in the upper part so that there is a series of oil troughs in it.

Openings in the tray permit the oil which overflows from the troughs to get back into the tank below. At the rear or flywheel end of the base there is a level gauge showing the amount of oil in the tank. This gauge is of the float type, a dial plate being placed horizontally on the end of the float tube. The float tube is carried high enough so as to be visible when raising the right-hand part of the engine hood.

The oil tank is filled through the breather pipe which extends up very high from the top of the forward end of the crankcase on the right-hand side.

The force-feed system is operated by a Pedersen pump of the rotary type, located within the crankcase casting, which has a small pump chamber located on the rear right-hand side.

The stream of oil taken from the reservoir is sent through an upward lead, a sight feed on the dash, and then, to the main bearings of the crankshaft. The oil lubricates the bearings copiously and then runs out of both sides of the bearing casings where it is caught up by pockets of a cup-shaped form, which have an oil hole in the bottom. This oil hole registers with an opening in the crank, which is hollow, as is also the crank pin. The revolving cranks send the oil to the crank pins by centrifugal force.

A spray of oil is being constantly thrown off the connecting rods which serves to keep the crankcase filled with a mist of oil.

The splash troughs should be filled before starting on a trip and, with the oil draining constantly into them from the force-feed system they will be always overflowing no matter at what level the car is running.

The connecting rods dip into the troughs and splash the oil up into the cylinder, lubricating the walls, as well as the cams, cam followers, cam shaft bearings, timing gears and wrist pin.

The other bearings on the car are equipped with grease cups and oiling holes according to their positions. The transmission is placed in an oil tight case and runs in an oil bath.

DETAILS OF WINTON OILING SYSTEM.—The Winton engine is oiled by both the splash and force-feed systems. The oil supply reservoir on the left-hand side of the motor is box-like in form and holds about eleven quarts. The oil reservoir is filled by means of a square opening in the top of the tank, the cover of which is removed by turning a round handle which projects from the top of the box. A gauze strainer is located just within the cover.

The oil is kept in circulation by twin pumps driven by the same eccentric off the crankshaft. The oil is pumped by one of these pumps to the top of the crankcase, from where it is led through direct leads to each main bearing. The crankshaft is drilled to provide an oil channel up into the crankpin, which is also drilled so as to provide an outlet for the oil into the connecting rod bearing, which is lubricated in this manner sufficiently to allow of an overflow of oil. This oil is thrown up into the cylinder and drains down into the splash troughs, which are molded directly in the bottom casting of the motor and are of sufficient depth to provide an oil well into which the connecting rod is allowed to dip, beating the oil into a spray. When the oil has reached the proper level in the splash troughs it is allowed to flow back to the rear of the engine base through a drain pipe. Here the oil is picked up by the twin plunger pump and delivered to the tank, where it flows through a vertical tube which stands perpendicularly in the tank and which is perforated near its top extremity. An umbrella-shaped baffle is placed over these perforations so that in case the cover is removed while the engine is in motion the oil will not spurt out of the tank.

The amount of oil supplied is regulated with a by-pass equipped with a throttle cock. When the latter is closed the entire oil flow passes through the system. When the cock is opened, however, there is a flow through the by-pass which takes the oil from the bottom through the pump into the top of the tank. If the cock is fully opened there will still be a small flow through the lubricating system, this being the minimum flow obtainable through the system

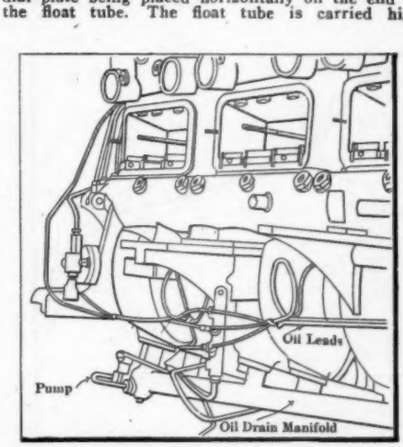


Fig. 7—Illustrating the Winton oil drainage system and the supply leads from the pump to the various bearings

SPLASH SYSTEM ON THE MAXWELL I.—The Maxwell Model I is lubricated by the oil spray created by the splash of the connecting rods into the pools of oil which are held by the series of troughs placed below the respective cylinders. The oil supply is held in the bottom of the crankcase in these splash troughs and also in the supply tank, and is kept in a state of continual circulation. This circulation is kept up by means of a gear driven pump located on the left-hand side of the motor and operated by means of the cam shaft.

The course of the oil as it passes through the oiling system may be traced by following the pipe leads starting from the tank. The oil starts from the tank which is placed at a considerable height above the pump and therefore has a head sufficient to give the oil a ready flow. The lead from the tank to the pump is for the most part straight and leads directly into the suction port. From here the oil is forced up to the sight feed on the dash. After passing through the sight feed the oil will flow down into the crankcase to replenish the supply in the splash troughs and maintain it at the proper level. After attaining this level there will be a flow into the stand pipe placed at the proper height to catch the oil and lead it back again to the pump, from where it is passed up to the tank from which it started and is thoroughly strained before again passing through the system.

All the moving parts within the motor itself are lubricated by the splash.

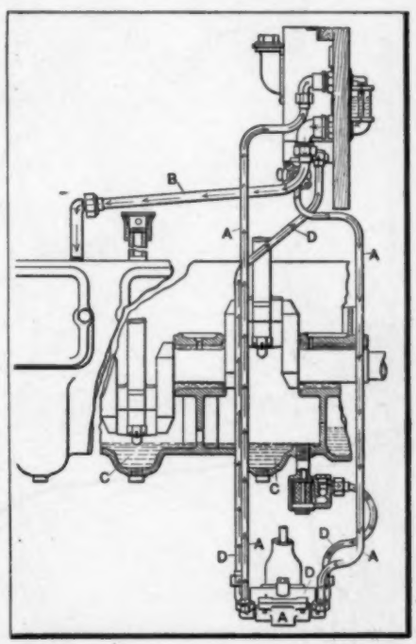


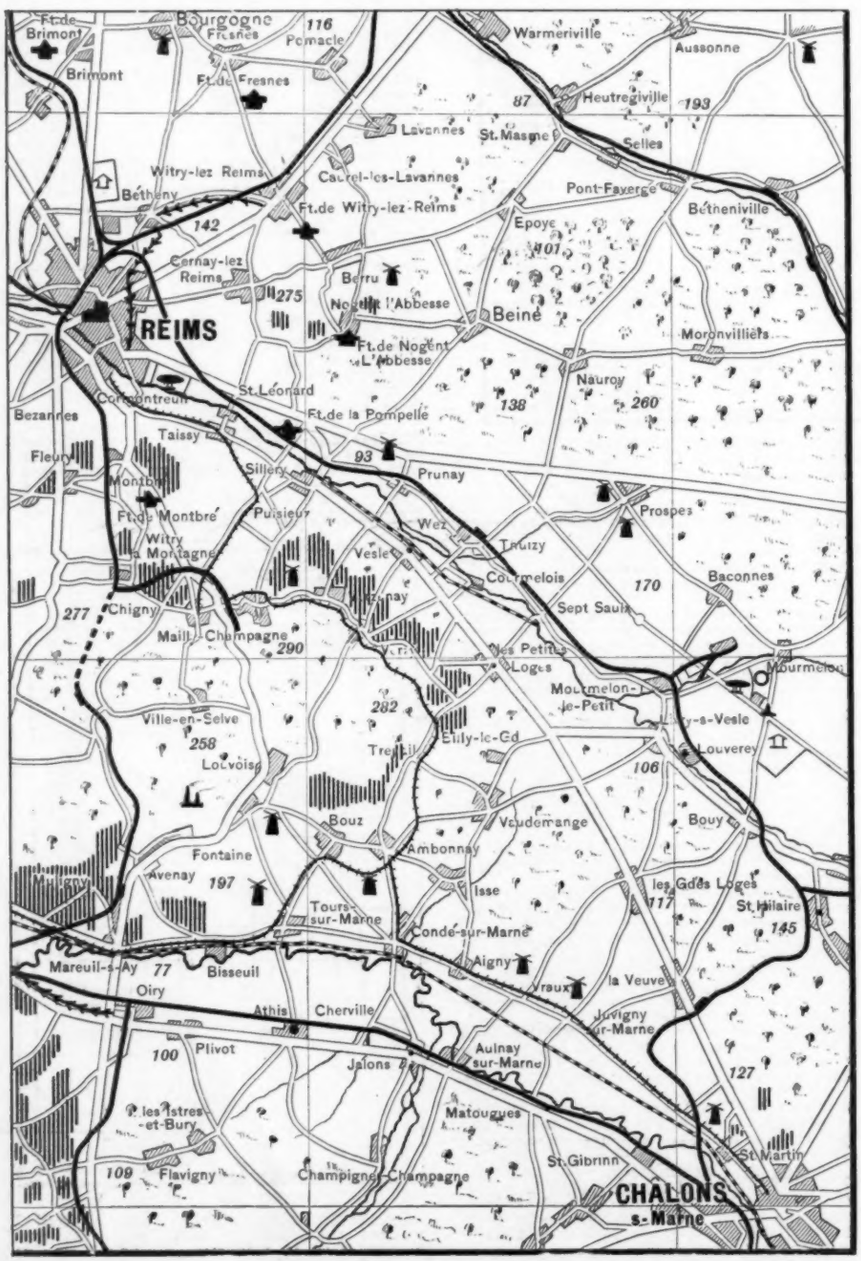
Fig. 8—The oiling system of the Maxwell I, A—Lead from tank to pump and sight feed. B—Sight feed to crankcase. C—Splash troughs. D—Lead from splash troughs to pump and back to tank

Making Maps for Air Travel

To Enable Aviators to Find Their Way Day or Night

The French Government, which has made the aeroplane an adjunct of the army, has just finished plotting the first of its charts designed specially for the guidance of aviators, and is actively at work on similar charts covering four thousand square miles of territory. A reproduction of the original map and an illustration showing the manner of its installation on the air machine are here given, intended to help to a proper understanding of the text.

AERIAL navigation has reached a stage of development in Europe, and especially in France, of which the average American, for all his intense and intelligent interest in this novel and fascinating form of locomotion, has little conception. On this side of the Atlantic opportunities of observing at first hand the capabilities of the aeroplane are still limited to infrequent and widely scattered exhibition flights and the small-scale experiments of the War Department. In Europe the aeroplane, as evidenced by the report a few days ago of the inauguration of taximeter-aeroplane service out of Lucerne, has become a staple of transportation. Aeroplane hangars are as common as automobile garages were in the United States a dozen years ago, hydrogen gas depots for the service of dirigible balloons are to be found in every considerable town, and aerial flights, except the very few especially remarkable for extreme length or extreme daring, such as the crossing of the English Channel, the Pyrenees or the Alps, arouse only the languid interest of the every-day spectacle.



A part of the Châlons sheet, showing the twenty-five miles between Châlons and Reims

In France the manufacture of aeroplanes has become an industry of large proportions. A year ago Blériot had already sold over two hundred and fifty machines, and Farman, Sommer, Antoinette and Voisin had booked orders for from twenty to fifty machines each. In the interval other manufacturers have entered the field, and the demand for aeroplanes has grown at a tremendous rate. All the manufacturers issue handsomely illustrated catalogues of standard sizes and types of stock machines. Each manufacturer has from one to three factories, and each his *école* for the instruction of intending purchasers and of professional aeronauts. For about 1000 francs one can learn to fly and obtain a pilot's license. A year ago these schools of flight had graduated over four hundred pupils. To-day their monthly output numbers scores.

The actual piloting of aircraft over the short distances and at low altitudes attempted in the early days of aerial navigation was a matter of no difficulty. The pilot was always in sight of familiar landmarks and knew, in a general way at least, the character of every foot of the ground over which he flew. But as soon as cross-country flights became common pilots on "the high seas of the air," to quote a French army pilot, discovered that charts were an absolute necessity, and they were not long in making the further discovery that their requirements were very imperfectly met by the topographic maps of the ordinary character available to them. Hence there arose an increasingly insistent demand for charts especially designed to meet the needs of aerial navigators. The first step toward the

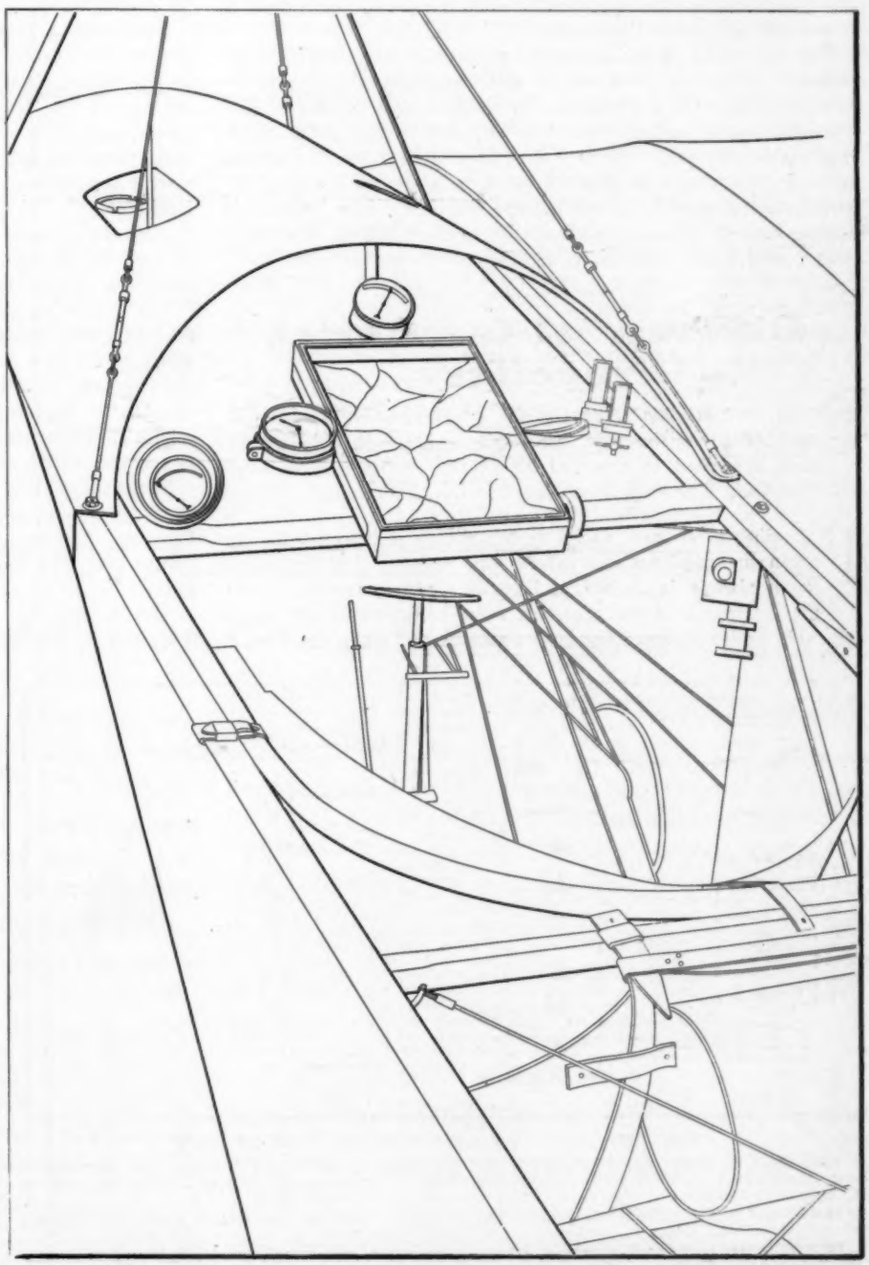
complete charting of the country for aerial service has just been taken in the publication, by the Geographic Service of the French Army, of an aeronautic chart covering an area of nearly 4,000 square miles.

As a matter of fact, French air pilots had no choice but to await with what patience they could the initiative of the War Department. The Geographic Service of the Army is the only organization in the country with means at its disposal for rapid and efficient execution of work of this character. In spite of the urging of the sporting fraternity, and even of aeronautic experts within the Army, the War Department showed no interest in the matter until about two years ago and no inclination to carry out the project of recharting the country until after the grand Army maneuvers in Picardy in 1910. Aircraft were given a thorough trial in these maneuvers in military operations on a grand scale and conclusively demonstrated the immense possibilities of the aeroplane and dirigible in warfare. The War Department suddenly awoke to the value of special charts for aerial service, and, after a thorough inquiry into the requirements of air pilots, instructed the Geographic Service to prepare and publish, as an experimental sheet, an aeronautic chart of the district about Châlons.

The ideal set before the designers of the chart was to produce a map which should give the air pilot all the data necessary to enable him to set and hold a course at any time and under any atmospheric conditions, to avoid dangerous landings and to locate himself readily by the landmark indications on the chart at any point of the region covered by the sheet. The problem of largest importance was the determination of the proper scale and size of the printed sheet. It had to be small enough for convenient handling and at the same time cover a considerable area, so that when sheets are available for the whole country the pilot on long flights will not be unduly burdened with paper. Most important of all, the many data to be accommodated on the chart had to be disposed in such a manner as to be clear and legible at a glance.

The chart indications essential to aerial navigation are much more numerous than those of the ordinary topographic map. The aeronautic chart must show all roads, distinguishing the main highways from those of secondary importance, for the air pilot in flying over inhabited places or road intersections must be able to recognize the route leading to his projected destination. Double-track railways must be distinguished from single-track lines, since the latter are invisible from altitudes above 1,400 feet. Water surfaces, being visible from great distances and any altitude, are most important as landmarks, and all streams, lakes, and ponds must be clearly marked. Woods and forests also are extremely good landmarks, and the indication of clearings and of main forest roads is of importance. The charting of towns and villages must show their actual shape, the courses of all intersecting roads, and especially the exact location of the principal church steeples. In country districts, large buildings, windmills, isolated trees and cemeteries must be shown when they are salient features of the landscape; the smoke stacks of factories also are in many cases useful indications of direction. Fundamentally, of course, the aeronautic chart must be a topographic map and must show clearly the configuration of the ground, the valleys and gullies, the flat and sloping surfaces, isolated mounds and high bluffs. Altitudes must be given for every considerable elevation, not only to indicate their value as landmarks, but principally to show the pilot how high to fly. The mean declination of the compass must be indicated, to enable the pilot to fly during darkness and to regain his course when driven out of it by adverse conditions. Finally, the chart must show the location of all aviation parks, military parade grounds, hangars for aeroplanes and dirigibles and hydrogen gas depots and especially places where an attempt to land would be attended with great danger on account of the presence of vineyards, orchards, gardens, hop fields, ditches, hedges, quarries or electrical transmission lines.

In the Châlons sheet just published by the Geographic Service these diverse elements have been combined in a highly successful manner. In a reasonable space and without undue crowding they



The quarterdeck of a Blériot monoplane. In the center the chart holder; on the right, the compass; above, the barometer; on the left, the clock and the revolutions indicator

have produced a chart which is really an adequate picture of the district covered by the sheet, legible at a glance and readily understood by a person having no previous experience with topographic maps. The scale chosen was that of the ordinary military maps of the French Army, 1 to 200,000, about three miles to one inch. The sheet measures 16 by 26 inches and covers an area of about 50 by 80 miles.

The chart is printed in six colors. The basic tint is buff, toned to represent the topography of the ground. Against this background the white of the roads and the blue of the water surfaces stand out clearly. Woods are indicated in tones of green, and towns, villages and dangerous landings in red. Black is used for railways, railway stations and figures of altitude. The actual profiles of important churches, steeples and towers are silhouetted in black. Conventional signs shown in the accompanying key, also printed in black, are used for smoke stacks, large buildings, windmills, isolated trees and other landmarks. Aviation parks and military parade grounds are printed in white over the buff and bear in red the conventional signs used for dirigible and aeroplane hangars and gas depots. The magnetic declination is printed in degrees on the margin.

The experience of the aeronautic experts of the military establishment at Châlons has shown this experimental sheet to be admirably suited to the purpose for which it was designed. Encouraged by its success, the War Department has ordered the charting of the quadrilateral Paris-Amiens-Givet-Bar le Duc, an area of over 9,000 square miles, which is to be the scene of the grand maneuvers during the present Summer. The indications for the use of air pilots incorporated in the Châlons sheet have been found useful in military operations on the ground.

Differential for Aerial Propellers

Granting that landing is that phase of aeroplaning which has caused the destruction of many a machine, the device here described is expected to prevent many accidents of this kind. The original appeared in Der Motorwagen.

IN landing after most aerial flights gliding is resorted to, the engine having been shut off for this purpose. Such a landing is always dangerous, at least in a certain measure, both for the machine and the operator, since preparations for landing are made at an altitude frequently so great that such obstructions as fences, inequalities of the ground, etc., are not always noticed. When the flying machine has come so close to the ground that these objects can be recognized distinctly the impossibility of a successful landing may be seen, in many cases, too late to restart the engine and rise to a greater altitude. This takes time, as two operations are necessary to attain the end, viz., the restarting of the motor and the adjustment of the elevating rudder. Furthermore, fractions of seconds are decisive at such times.

It happens even to skilled operators that the wheels or the chassis of the aeroplane come to grief in landing, and there is nothing surprising about such an occurrence, considering the high velocity with which the machines strike the ground. Braking the front wheels would in most cases result in overturning the machine owing to the inertia of the rear portions, while braking the rear wheels would probably be without any effect because of the small weight of the tail end of most machines. However, braking is desirable in aeroplaning for other reasons also, principal among which is the fact that there is seldom an abundance of landing ground.

But, since a great velocity is essential in making a gliding descent, the brake effect should be a sudden and strong one at the very moment when the front wheels touch the ground, or, better yet, when they are still about two or three feet above it.

To effect braking and also to make possible an easy upward start after gliding for some time, the German constructor, M. Bucherer, of Cologne, has built a differential brake for aeroplanes, the essential feature of which lies in the possibility of slowing down and eventually reversing the propeller at the right instant to enable the aviator to make a safe landing.

The inertia of the flyer naturally excludes the possibility of reversing the motion of the machine as a whole, the effect of which would be a disastrous one, and the only result of reversing the propeller is a very considerable reduction of its speed just before it is expected to land. If, however, a handicap should be espied at this instant the motor power could be utilized again to rise higher in the air.

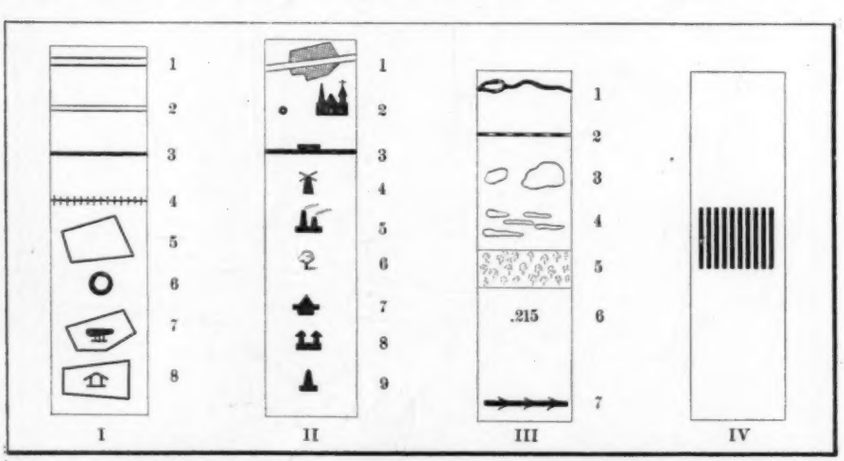
In the illustration is seen the Bucherer aeroplane engine, which is of the rotary type, with air-cooled cylinders of 90 by 182 millimeters. The propeller is not mounted on the crankshaft, in accord with the general practice of the day, but a differential gearset connects crank and propeller shafts. The crankshaft carries a disc, on which two pivots are placed diametrically. These, in turn, carry the revolvable internal brake jaws.

The internal and external brake jaws, which are located at the inner and outer surfaces of the brake housing respectively, are actuated alternately. The housing contains, in its front portion, a differential gearset, the small pinions of which are rotatably located on the two pivots of the axle cross. One of the two large differential wheels is a unit with the crankshaft and the other with the propeller shaft. The external brake is located at a point not shown in the illustration.

The operation of the differential is as follows:

1. If the external brake is loose the crankshaft turns from the left to the right. The internal brake is held in such a position that its jaws make the housing rotate by friction. The small pinions act as a clutch between the large wheels, and the propeller shaft is rotated in the same sense as the crankshaft.

2. If both the external and internal brakes are loose the small pinions are driven by the one big differential wheel and work on the other wheel of the propeller shaft.



THE CONVENTIONAL CHART INDICATIONS FOR USE OF AIR PILOTS

I—1, Main highways; 2, other roads; 3, railways, single- or double-track; 4, narrow-gauge railways and tramways; 5, aviation parks and landing places; 6, hydrogen-gas depots; 7, dirigible hangars; 8, aeroplane hangars

II.—1, Towns and villages; 2, steeples and churches; 3, railway stations; 4, windmills; 5, smoke stacks; 6, isolated trees; 7, fortifications; 8, castles; 9, towers

III.—1, Water courses; 2, canals; 3, lakes and ponds; 4, marshes; 5, woods; 6, altitudes; 7, electric transmission lines

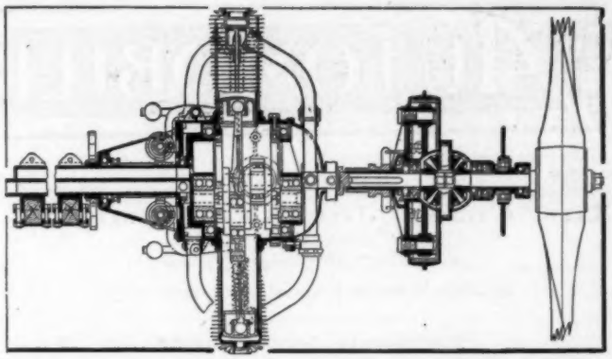
IV.—Dangerous landings; wire fences, vineyards, orchards, gardens, hop yards, quarries, ditches and hedges

which latter does not now rotate. The brake housing rotates with the small pinions.

3. If the internal brake is loose and the external brake is fast in position, holding the brake housing in place so that it cannot revolve, the state of affairs is as follows: The crankshaft rotates as before, from left to right. The small pinions which are set on pivots in the now resting brake housing cannot revolve around the crankshaft and thus impart motion to the propeller shaft, which is made to rotate in the opposite direction to the crankshaft, from right to left.

If this machinery is utilized for landing it is possible to reverse the propeller instantly by braking the housing by means of the contracting-band brake without stalling the motor. At the same time the free-running number of revolutions of the engine falls to normal, and the motor then drives the propeller with full force in the direction opposite to that in which it was rotated before thus holding the aeroplane back.

The increase of weight and the addition of machinery to the aeroplane ought to be compensated for by the various great advantages of the installation of the differential set on the aeroplane.



Section of the Bucherer rotary aeroplane engine in which a differential is interposed between the engine crankshaft and the propeller shaft

As to Motion Study

The principle of intensive cultivation, as it is understood in an agricultural sense, must be applied to the production of automobiles, if the manufacturer hopes to make the most of his facilities.

INTENSIVE cultivation is the idea which dominates the activities of a burglar when he is prying open a vault, just as much as it is the idea that stands behind efficacious work in an agricultural sense. It is this same intensive cultivation that permits one maker of automobiles to turn out a large number of cars per annum under a given set of conditions and it is the absence of this condition that keeps another maker, although he may be endowed with the same facilities, from getting his quota of results. As a preliminary to intensive cultivation, motion studies will have to be indulged in, and the impression is harbored that too many builders of automobiles have substituted the brutality of the "accelerator" for the intelligent wiles of the master in motion study; but the time is not so far away when intelligence will have to sway the issue, even at the expense of being introduced in the person of the receiver. There is a superstition which has its foundation in the idea that cooperation is supplanting competition, but when the awakening comes the victims of lack of foresight will find to their sorrow that the master of motion study is the leader in the competitive department, and that his cleverness is two-fold, due to the fact that he not only points the way to more and better work per dollar of overhead, but he does it so silently that the neighboring maker who should be in a position to compete for success is fettered to his own stupidity.

Calendar of Coming Events

Handy List of Future Competitive Fixtures

Race Meets, Runs, Hill-Climbs, Etc.

July 5-22.....Winnipeg, Man., Fourth Canadian Competition for Agricultural Motors.
July 15.....Philadelphia, Track Races, Belmont Park, Norristown Auto Club.
July 14.....Philadelphia, Commercial Reliability Run, Quaker City Motor Club.
July 15.....Guttenberg, N. J., Track Races.
July 15-17.....St. Louis, Mo., Reliability Run, Missouri Automobile Assn.
July 17-19.....Cleveland, O., Three-Day Reliability Run of the Cleveland *News*.
July 17-22.....Milwaukee Reliability Run, Wisconsin State Automobile Association.
July 21-22.....Brighton Beach, N. Y., Twenty-four-Hour Race.
July 20-28.....Minneapolis Reliability Run, Minnesota State Automobile Association.
Aug. 1.....Chicago, Ill., Commercial Reliability Run, Chicago *Evening American*.
Aug. 3-5.....Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 12.....Philadelphia, Reliability Run, Quaker City Motor Club.
Aug. 12.....Worcester, Mass., Hill Climb, Worcester Automobile Club.
Aug. 17.....St. Louis, Mo., Reliability Run, Missouri Automobile Assn.
Aug. 25-26.....Elgin, Ill., Stock Chassis Road Race, Chicago Motor Club.
Sept. 1.....Chicago, Ill., Commercial Reliability Run, Chicago Motor Club.
Sept. 1.....Oklahoma, Reliability Run, *Daily Oklahoman*.
Sept. 2-4.....Brighton Beach, N. Y., Track Races.
Sept. 2-4.....Indianapolis Speedway, Track Races.
Sept. 4.....Denver, Col., Track Races, Denver Motor Club.
Sept. 7-8.....Philadelphia, Track Races, Philadelphia Auto Trade Association.
Sept. 7-9.....Hamline, Minn., Track Races, Minnesota State Automobile Association.
Sept. 12-13.....Grand Rapids, Mich., Track Races, Michigan State Auto Association.
Sept. 15.....Knoxville, Tenn., Track Races, Appalachian Exposition.
Sept. 16.....Syracuse, N. Y., Track Races, Automobile Club and Dealers.
Sept. .....Denver, Col., Track Races, Denver Motor Club.
Oct. 3-7.....Danbury, Conn., Track Races, Danbury Agricultural Society.
Oct. 7.....Philadelphia, Fairmount Park Road Race, Quaker City Motor Club.
Oct. 9-13.....Chicago, Ill., Thousand-Mile Reliability Run, Chicago Motor Club.
Oct. 16-18.....Harrisburg, Pa., Reliability Run, Motor Club of Harrisburg.
Oct. .....Atlanta, Ga., Track Races, Atlanta Automobile Assn.
Nov. 1.....Waco, Tex., Track Races, Waco Auto Club.
Nov. 2-4.....Philadelphia, Reliability Run, Quaker City Motor Club.
Nov. 7-10.....Los Angeles-Phoenix Road Race, Maricopa Auto Club.
Nov. 9-11.....San Antonio, Tex., Track Races, San Antonio Auto Club.
Nov. 10.....Phoenix, Ariz., Track Races, Maricopa Automobile Club.
Nov. 28-30.....Savannah, Ga., Vanderbilt and Grand Prix Races, Savannah Automobile Club.
Nov. 30.....Los Angeles, Cal., Track Races, Motordrome.
Dec. 25-26.....Los Angeles, Cal., Track Races, Motordrome.

Foreign Fixtures

July 13-20.....Ostend, Belgium, Speed Trials.
July 21-24.....Boulogne-sur-Mer, Race Meet.
Aug. 6.....Mont Ventoux, France, Hill Climb.
Sept. 2-11.....Roubaix, France, Agricultural Motor Vehicle Show.
Sept. 9.....Bologna, Italy, Grand Prix of Italy.
Sept. 10-20.....Hungarian Small-Car Trials.
Sept. 16.....Russian Touring Car Competition, St. Petersburg to Sebastopol.
Sept. 17.....Semmering, Austria, Hill-Climb.
Sept. 17.....Start of the Annual Trials Under Auspices of *l'Auto*, France.
Oct. 1.....Gaillon, France, Hill-Climb.
Oct. 12-22.....Berlin, International Automobile Exhibition.

THE AUTOMOBILE

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The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

INTEREST seems to be centered around the idea of silence of performance of automobiles. In the last few years the enthusiasm of salesmen was spent in the process of telling customers how silently their products performed. These salesmen were afflicted with a disorder that might have been called "hypnotic hearing." Despite the terrific din that some of their products made they could hear nothing in the shape of noise that seemed to be worth recounting to their "prospectives." It is almost uncanny that the silence of performance that they thought they had entrapped in their mechanisms is a reality to-day. The casting-out of the "noise devil" from automobiles is the surest indication the world has ever had of the fact that progress comes from promise and that anything man desires he can get if he goes after it.

* * *

EFFICIENCY is a much-abused word, meaning almost anything under the sun, and, at best, it is but a relative term. The efficiency of an automobile must ultimately be measured in terms of units of utility per dollar of cost, but it will take a fair display of ingenuity to describe a unit of utility. The best and the worst automobile might succeed in carrying five passengers a certain distance per day and continue to do the work for a term of years with the cost ranging neck and neck, or nearly so; but the worst automobile might ride its owner into an early grave or an insane hospital, or into poverty, whereas the best automobile should bring to its owner a heaping measure of well-being. The difference between the two may be measured in annoyance or the absence of it, and it is more than likely that the annoying type of automobile will beat a path to the tire man's store, the place where they "compound" gasoline, and to the garage repair-shop, whereas the car that holds within its maw the fullest measure of utility will show a fondness for the boulevard and a capability over the dirt road leading to the house of ozone over the hills and far away.

* * *

THERE is some evidence of a strained attempt to create sleeve types of motors as shown by some of the examples of these mechanisms as they appear in THE AUTOMOBILE this week, and goes to show that all the passengers in a "band-wagon" are not equally entitled to ride. Getting into the "band-wagon" is a very popular enterprise, but those who pay the piper will have to train their ears to distinguish between the tune of the music emitted by the fellow who occupies the front seat in comparison with the wail that characterizes the chap who jumps on as the wagon goes by. It is going to be a little difficult for the average purchaser of an automobile to arrive at a safe and sane conclusion of the difference between a good poppet valve type of motor and a bad job in the field of newer promise. It might be worth while to take a look at steam engineering for purposes of comparison, and a mental sojourn into the land of this old and stable art will lead the observer to the conclusion that the good examples of the various makes of steam engines are as prevalent to-day as they were a decade ago, but the users of steam engines seem to have the good sense to put a 40,000 horsepower quadruple expansion steam engine in an ocean greyhound, a 20,000 horsepower compound engine in a locomotive, a "simple" engine in an isolated plant, and a "safe" engine in an automobile. When the time comes to review the automobiles of the next ten years it is fair to say that the well-designed poppet valve type of motor will be represented by many good examples of them, the sleeve type of motor will have found its working level, the rotary valve will be a member of the congress of desirable mechanisms, and the piston valve will cast its shadow over a considerable zone of activity.

* * *

WHILE the struggle is going on to perfect motors, making them more simple and reliable to the entire elimination of noise, it will be the pleasure of most designers to discover that the disconcerting sounds to which automobilists take exception are largely in the chassis outside of the motor. There is every evidence of the ability of the worm drive co-operating with the silent chain to cure these noises. With silence of performance will come long life, and in the explanation of the reason for this desired condition account must be taken of the increased flexibility that is a natural attribute of a chain drive. Any mechanism that will prevent the load from coming on the members positively and quickly will save these members from the shock of instant loading, and a simple way to appreciate the good that will come from softening the blow lies in the mere statement that if the time of loading is increased to two seconds instead of one, the shock will be halved. There is every reason to believe that the designers of automobiles have turned their backs upon the "stable platform" so called, centering their interest in the conditions for flexibility as the most desirable characteristic in any automobile.

Automobile Board of Trade Active

Will Work for Good of Membership in Patent Matters

General Manager Bonnell, in an interview with THE AUTOMOBILE, *is authority for the statement that the newer organization, in taking the place of the old A. L. A. M., expects to work for the general good of the automobile industry, but that its plans are more or less passive, excepting that there is some activity in patent matters.*

THERE is some indication of pending patent litigation in the automobile industry. Certain companies holding patents are likely to start litigation, the idea being to impress possible infringers with a due respect for the rights of the owners of patents, as they are prone to claim, but it is the policy of the A. B. of T. to protect its membership from "exactions" on the part of those who may not be as conservative as the claims of their patent specifications might indicate to a man with a clear head and some legal lore. As for the patents that are in the possession of the board, or owned and controlled by the membership, it is the idea to protect the rights that belong thereunder. The board may also extend its domain in the realm of patents.

As a general proposition, according to General Manager Bonnell, it is not the purpose of the board to meddle with any matter that does not come properly before it. While there are a great many things going on all of the time in the automobile business, most of them are in the nature of activities that the respective companies are likely to be in a position to handle without the assistance of the Board of Trade, limiting the activity of the board to the questions that are too broad to be confined to the direction of a single company. As a broad assumption it may not be out of place to expect that the board work will depend upon the measure of benefit that is to be derived from an effort. If the benefit is to be confined to an individual company, that concern will be expected to do the work, but if the benefit promises to be general, it is then to be expected that the board will do the work and shoulder the cost of the effort. Mr. Bonnell states that the general trend of the automobile business is upward and that there is no cloud in sight such as would tingle the sensibilities of a pessimist.

Preparing for South's Big Road Convention

RICHMOND, VA., July 10—Preparations have just been completed by the American Association for Highway Improvement for the scouting tour of automobiles from Washington to Richmond, which is to pave the way for the big gathering of automobiles, as part of the Good Roads Congress to be held in Richmond, October 30 to November 1. Acting in conjunction with the Touring Club of America, the Highway Association has arranged for this scouting party, consisting of Paul D. Sargent, assistant director of the United States department of public roads; P. St. Julien Wilson, State Highway Commissioner of Virginia; F. H. Elliott, secretary of the Touring Club of America; J. E. Pennypacker, Jr., secretary for the American Association for Highway Improvements, and some of the Washington members of the Touring Club.

At least 500 automobiles will make the trip to Richmond in October to attend the convention of the American Association for Highway Improvements and the congress of its allied organizations.

The plans of the Highway Association and the Touring Club are to have all tourists from Northern, Western and Northwestern cities to gather in Washington, from which place they will move on to Richmond in an impressive procession. Automobilists from the South, of course, will come to Richmond.

The exposition feature of the convention is already attracting much attention among the manufacturers of road machinery and materials, and requests have been made for more than half the space in the building assigned for exhibits.

General Bingham Deserts Pavement Job

General Theodore A. Bingham, who made such a fuss as Commissioner of Police that it ended in a legal entanglement involving the Mayor of New York, will be remembered as having impressed Borough President McAneny with his peculiar ability to mend the wretched pavement that has long been an eyesore to everyone, and it comes as a shocking surprise to learn that Bingham has resigned his position as Chief Engineer of the Bureau of Highways, leaving behind him the impression that a few yards of red tape and other forms of official inertia were too much for him to overcome. Bingham, however, seems to think that the Bridge Department will give him something more in keeping with his ability. In the meantime the streets of New York are in a wretched state, and the citizens in general, not forgetting automobilists in particular, have every reason to believe that the whole situation might be mended were some capable man to take charge of the work, one in fine who might persuade himself to use a sharp knife on red tape and persuasion of an effective kind upon opposition.

Leland Succeeds Henderson as A. B. of T. Director

At the first quarterly meeting of the members of the Automobile Board of Trade, since its incorporation, which was held July 6 at its offices, No. 7 East 42d Street, New York, President Clifton announced that the new organization went into operation on July 1, and had taken over the A. L. A. M. offices.

A meeting of the Directors of the new organization was also held, and W. C. Leland, of the Cadillac Motor Car Company, was unanimously elected to fill the vacancy created by the resignation of Thomas Henderson, who has retired from business.

A number of important matters in connection with the new organization, such as patents and the forthcoming automobile show in New York, were discussed.

Motor Accessory Manufacturers' Board Meets

A meeting of the Board of Directors of the Motor and Accessory Manufacturers was held at the association's offices, 17 West 42nd Street, New York City, on July 7th, 1911. The following-named concerns were elected to membership: The Allen Auto Specialty Co., American Circular Loom Co., Champion Ignition Co., and the Detroit Carriage Co.

James H. Poster, of the Hydraulic Pressed Steel Company, Cleveland, Ohio, was elected a member of the Board of Directors to fill the unexpired term of the late Mr. W. S. Gorton. H. W. Chapin, of the Brown-Lipe-Chapin Company, Syracuse, N. Y., was made permanent treasurer of the association to fill the unexpired term of the late Mr. Gorton.

N. A. A. M. and M. & A. M. to Show at Palace

The most important action of the monthly meeting of the National Association of Automobile Manufacturers, Inc., held on Thursday, July 6th, was a decision to conduct an automobile show at the Grand Central Palace, New York, opening on January 10th and closing January 17th, 1912. This show will be open to all manufacturers, and it is known as the result of extensive correspondence carried on during the past month, that practically all of the manufacturers who do not exhibit at Madison Square Garden will take part. It is also practically settled that the Motor & Accessory Manufacturers will take the greater part of the space devoted to that branch of the industry which the association represents.

This show, it will be observed, will run during the last four days of the first week and first three days of the second week of the Garden show. It will embrace both passenger and commercial vehicles, each, of course, in separate departments. This arrangement is made possible by the splendid facilities offered by the new Grand Central Palace.

The building is located two blocks farther north than the old palace, is built entirely of stone and marble, except as to the floors, which are laid on concrete and fire-proofed, and affords 126,000 square feet of floor space.

The method of space allotment will be the same as that at the Chicago show. The executive committee referred all other details to the show committee and the general manager with full authority to proceed.

The Krit Motor Car Co., and Grabowsky Power Wagon Co., were elected to membership.

Favorable action on applications for reinstatement was taken in the cases of Vanderwater & Co., Ltd., Crawford Automobile Co., Warren Motor Car Co., and James Cunningham Son & Co., who took part in an unsanctioned show last winter and were therefore debarred from participation in sanctioned automobile shows.

C. G. Stoddard resigned as the representative of the Dayton Motor Car Co., and Alfred Reeves was elected as representative of that company and to fill the vacancy created on the executive committee.

The membership of Charles E. Duryea was transferred to the Duryea Auto Co., of Saginaw, Mich., and Harry S. Houpt was elected to represent the American Locomotive Co., in place of James Joyce, retired.

The members present at the meeting were: W. E. Metzger, Charles Clifton, Alfred Reeves, L. H. Kittredge, S. T. Davis, Jr., H. O. Smith, A. L. Pope, S. A. Miles, Thomas Henderson, J. W. Gilson, Benjamin Briscoe.

1912 Announcements Plentiful in Detroit

DETROIT, July 10—The present month has been featured by a considerable number of factory announcements of 1912 lines, among the most recent of which are those of the Chalmers, Regal and Abbott-Detroit. In all these cases it is a notable fact that the makers have gotten farther and farther away from the old system of building but one chassis, which is equipped with a body variety as great as possible.

The Chalmers Co. will produce three chassis types—the "30," "40" and a new one of 36 horsepower. The last mentioned will be equipped with a self-starter and demountable rims. A four-speed transmission is also a feature.

The Regal Co. will continue its "30" and "40" as well as its underslung "20" roadster. It adds, however, an underslung "35" with a five-passenger body.

The Abbott Co. has supplemented its "30" with a "Model 44" seven-passenger type with a long-stroke motor, 4 1-2 by 5 1-2 inches.

Another company that is enlarging its line for 1912 is the Brush Runabout, which is adding the "Liberty-Brush"—a simpler type than the regular single-cylinder model which has proven so popular for runabout use.

The increased diversity in models is becoming a remarkable feature, as, in addition to those mentioned, the Metzger Motor Car Co. and the Packard have both announced 1912 "sixes" in addition to their regular lines. In fact, of the larger Detroit factories, the Ford, Warren and Cadillac are now about the only ones locally which still stick to one chassis type. None of these companies has made a 1912 announcement as yet. The E-M-F Company branch of the Studebaker corporation really deserves ranking as a fourth in this group, as its two chassis types are put out at separate plants and by separate manufacturing organizations.

Bergdoll to Head A. M. A. A. Show Committee

The Executive Committee of the Automobile Manufacturers' Association of America which is composed of many of the leading independent makers who are not identified with the new Automobile Board of Trade, held a meeeting at their headquarters in the Night and Day Bank Building, corner of Fifth Avenue and 44th Street, on Friday afternoon, when plans for their annual Automobile Show, which will be held in the new Grand Central Palace during the week of January 1, were discussed.

After the meeting it was announced that arrangements had been concluded with the Aeronautical Manufacturers' Association, setting aside the entire third floor of the Grand Central Palace for the exhibition and display of the latest types of aeroplanes with their motors and accessories.

At the conclusion of the meeting it was announced that Louis J. Bergdoll, head of the Bergdoll Motor Company of Philadelphia, had been appointed chairman of the Show Committee and that the other members of the committee would be appointed later.

Convenient T. C. A. Maps for Motorists

Eight new map sections covering the most popular touring districts of America and which have been compiled under the auspices of the Touring Club of America, are now being distributed among members of the club and other motorists. These maps include in their respective sections, New England, showing all the popular touring routes through Massachusetts, Connecticut, Vermont, New Hampshire and Rhode Island; Maine, with the best routes to Canada; New York with a section of Canada; New Jersey and Pennsylvania, the Middle West, Southeastern part of the country and the Southern States. The maps are compiled on a scale of two miles to the inch and are very legible, mounted on linen, while the mileage distances between various towns and cities situated along the main routes are clearly defined.

Premier Transcontinentalists' Progress

CHICAGO, July 8—The ocean-to-ocean tourists reached Chicago Thursday and passed Friday here. To-day they headed west again intent on making Davenport, Ia., by night. In the party are thirty-eight enthusiastic motorists, eight of whom are women, who are riding in a dozen Premier cars, while accompanying them are a motor truck for carrying the surplus baggage and a service car. Preceding them and blazing the trail is Ray McNamara, who knows every foot of the road from one coast to the other.

Miles Spending Dog Days in Maine

S. A. Miles, general manager of the National Association of Automobile Manufacturers, is invading Christmas Cove, Maine, where he will spend nearly all of his time until the end of October. Arrangements have been completed for the show at the Grand Central Palace in New York this year, which undertaking adds materially to the activities of General Manager Miles.

Five Perfect Scores in Missouri A. A. Run

ST. LOUIS, July 10—Five touring cars finished with perfect scores in the July 4 reliability run of the Missouri Automobile Association. The contestants made unusually good time over the 347 miles course. There were two divisions, one for pleasure cars and the other for trucks.

The pleasure car score was:

Car	Driver	Score
Kline	Ashley Gray	Perfect
Selden	H. B. Beguelin	Perfect
Cadillac	Dan Wandell	Perfect
Case	E. L. Colwin	Perfect
Mercer	Charles Kean	Perfect
Firestone-Columbus	John Burns	991
Regal	Roy Anselm	991
Ohio	George Bolz	991
Mercer	R. W. Russell	989
Regal		976
Paige-Detroit	H. M. Paine	949
Ohio	George Mueller	Disqualified
Halladay	Robert Adams	Disqualified
Marion	R. W. Pissell	Disqualified

The score of the trucks was:

Car	Driver	Score
Atterbury	J. C. Summers	Perfect
Federal	R. Stellgis	Perfect
Atterbury	A. Fidler	993
Lambert	D. Perrin	984
Utility	T. H. Goddard	Perfect
Waverly	W. Koch	996
Atterbury	A. H. Elliott	Disqualified

Vice-President Henderson Honored

Thomas Henderson, of the Winton Motor Carriage Co., who has for many years been prominently identified with the work of the automobile trade associations, has decided to retire from active business life. He has already resigned his position on the executive committee of the Association of Licensed Automobile Manufacturers and will, on the first Wednesday of September, retire from the executive committee of which he has been a member for ten years.

On Thursday evening, July 6, twenty-five men in the trade, with whom Mr. Henderson has been prominently identified, held a dinner at the Engineers' Club in New York in his honor, and presented to him a loving cup and an address engrossed on vellum and beautifully bound. The gentlemen present, in addition to Mr. Henderson, were S. T. Davis, Jr., William R. Innis, W. T. White, A. L. Pope, Alfred Reeves, Charles Clifton, W. E. Metzger, S. D. Waldon, George Pope, R. D. Chapin, H. O. Smith, E. E. Bartlett, H. B. Joy, L. H. Kittredge, C. C. Hildebrand, Hugh Chalmers, J. W. Gilson, C. C. Hanch, S. A. Miles, Benjamin Briscoe, M. J. Budlong, R. D. Garden, Wm. Mitchell Lewis, W. C. Leland, Frank Briscoe.

The decorations, in recognition of Mr. Henderson's nationality, were largely of Scotch plaids, thistle and heather. Mr. Henderson, who, until the last moment, had no inkling of the event, was met on his arrival at the club by a Scotch piper in full regalia. The music of the evening also consisted largely o Scotch airs.

The address was presented by Mr. W. E. Metzger, president of the National Association of Automobile Manufacturers, Inc., and the cup by Mr. Charles Clifton, president of the Association of Licensed Automobile Manufacturers. Both gentlemen spoke earnestly and feelingly of the esteem in which Mr. Henderson is held by every one with whom he is acquainted and so did Colonel George Pope and others who followed. Mr. Henderson's response was a masterpiece, declared by every one present to be the finest thing of the kind to which it had ever been their good fortune to listen.

Stutz Busy Producing Racing Duplicates

INDIANAPOLIS, July 10—The first car built under the direction of Harry C. Stutz performed so encouragingly in the 500-mile International Sweepstakes at Indianapolis on Decoration Day, that the Ideal Motor Car Company of Indianapolis has instructed designer Stutz to duplicate this model as a manufacturing proposition. The Ideal Motor Car Company has a well-appointed building, three stories high, which was recently erected on Capitol Avenue by Carl G. Fisher. The new organization in addition to designer Stutz includes W. D. Myers as sales manager, and work has so far progressed in the new plant that deliveries are being promised for August 1, offering to purchasers three types of bodies including a roadster, a four-passenger and a five-passenger fore-door type of touring cars. Agencies are being booked, and the indications are that Indianapolis is to be the home of another very active company devoted to the building of automobiles.

Dead Horse Climb Arrangements Completed

The Dead Horse Hill Climb Committee consists of John P. Coghlin, chairman; J. W. Harrington, Daniel F. Gay, Chester E. Green, and Frederick S. Clark.

A. D. Converse, president of the Massachusetts State Automobile Association, will be referee; Wagner will do the starting.

Contracts have been placed for repairing the hill, which is somewhat down at the heels due to a season of excessively dry weather. In fixing the hill it will be packed with binder such as calcium chloride or Tarvia. Considerable interest is being aroused in this event, and a large number of entries are expected. Among the events scheduled there will be one in Class "A." An amateur event is scheduled for the Worcester County Championship, and another amateur event for gasoline cars only is listed. In Class "B," which is open to any chassis of gasoline cars that conforms to the "stock chassis" rules will be run off. Class "C" will also have its representation open to any gasoline car or chassis under the rules of the Contest Board. A free-for-all event is expected to arouse interest, and there will be two exhibition events, closing the day of sport with motor-cycle racing.

Willys and Garford Make a Trade Arrangement

It was erroneously reported in some of the trade papers last week that John N. Willys and Arthur L. Garford had joined hands, thus lending the impression that there was a combination of the Overland and Garford plants. George W. Bennett, executive head of the Willys-Overland plant, is authority for the statement that Mr. Garford holds no stock in the Willys Garford Sales Company. The new concern will market Garford trucks.

Racing Put in Disrepute by Advertising

Editor THE AUTOMOBILE:

In the Rayfield Carbureter advertisement of June 22, statement was made: "The 1912 model stock Lozier car, using a stock Rayfield carbureter, finished second, 32 minues behind the Marmon, having 11 tire changes against 4 tire changes made by the winning car."

This was evidently a clear case of hastily-prepared copy, since the Lozier car finishing second was 32 seconds behind the Marmon.

READER.

Vale, Lowell; Redivivus, Riverhead

With the announcement that the road race tentatively scheduled for the Lowell, Mass., course for September 23 had been definitely abandoned comes news that an effort is now making to promote a long-distance stock car contest over the Riverhead course. It is the idea of the promoters to stage the event for a Saturday late in September.

Schaeffers to Make Foreign Tour

Joseph Schaeffers, M. E., member of the S. A. E., is now taking an extensive European trip, during which he will visit England, Germany, Belgium and Austria to observe the progress that has been made in rotary valve and sleeve motors on the other side. He will return in seven weeks.

British Makers Looking for New Field

Passenger Automobile Business Falling Off

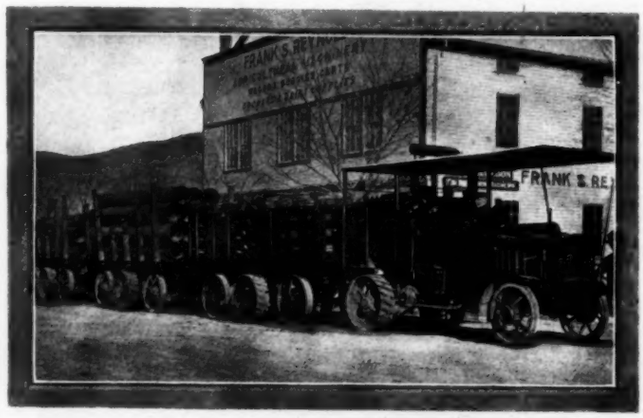
According to the latest advices from Coventry, Eng., the British makers of automobiles are in the grasp of sharp competition from the passenger automobile point of view and some of the more important of the companies are branching out. The story, as it is here related, tells how the newer activity is aimed to reach out, invading foreign countries, making the farmers of other lands pay tribute to British acumen.

A NEW phase of development has now been entered upon by the British automobile industry. The pleasure car business, which has for so many years been the sole support of the leading firms, is by no means the profitable undertaking which it was formerly. There is still, and always will be, a very large demand for touring and pleasure cars, but the gradual drop in power and price—till now the most popular vehicle is the 15-horsepower car at $1,800—has reduced the manufacturers' profits to a level which is actually serious in its outloook. With this fact before them, the most prominent firms have for some time past been casting around for new lines of profitable business, and passing by the aviation section as useless for yet some time to come, the majority have settled upon the commercial vehicle as the most promising field for future enterprise. As is generally known, the utility motor section has already been well developed in Great Britain, but, so far, a few comparatively small concerns have had the market to themselves, and their limited resources and output have been unable to make full use of the available demand.

One automobile firm to come forward with its fully matured plans is the Daimler Company. This firm, now amalgamated with the Birmingham Small Arms Company, employs over 5,000 men at its two Coventry works. In the present case, the latest designs of commercial vehicle, to be exhibited at the forthcoming Royal Agricultural Show at Norwich, have attracted general attention throughout the trade.

The chief sections of the Daimler commercial vehicle department comprise the omnibus, the agricultural tractor, and the road train for goods transport. Smaller goods lurries—up to 5 tons capacity—are likely to make their appearance in the near future, but at present the actual productions are as stated.

The Daimler motor 'bus has been on the road in its experimental state for over two years. In its final approved form, it has passed the searching tests imposed by the London Police Authorities (the new regulations for 1912 being in every way more exacting than before) and the appearance of a fleet of 200 of these vehicles on the London streets is definitely planned for the coming fall. The Premier Omnibus Company, a new $5,000,000 concern, will look after the operation and control.



Daimler road-train ready to "pull out"

Power unit for a long train of luggers

On the constructional side, the Daimler 'bus is a radical departure from all previous types. The frame consists of two long pressed-steel girders, joined together by a sheet steel member which also forms the foot-well for the interior body. From the two side members are suspended the duplicate power plants, each consisting of a 15-horsepower Knight motor, a dynamotor, clutch, propeller shaft and worm-driven live axle—this last not extending across the vehicle, but driving its own wheel only. For the equalization of the two propelling units, a buffer battery of some 24 cells is placed at the forward end of the chassis, beneath the driver's seat. By means of an ingenious, yet comparatively simple electrical control, the dynamotors alternately charge up, or take current from, the battery as occasion demands, and all that the driver has to do is to steer the vehicle and to move a single speed-control lever on top of the wheel. When running on the level with full load (36 passengers) the engines are developing about half-power, and the surplus energy is automatically used to charge up the battery till this is at full voltage. Then a solenoid automatically closes the throttles till the power of the engine is just sufficient to drive the bus along at the required speed. As soon as a hill is reached, the solenoid opens the throttles gradually, and, finally, if the grade is too steep for the engines themselves to take the vehicle up at full speed, the battery commences to supply current to the dynamotors, and in this way the requisite extra power is obtained. From the driver's point of view, the control is sim-

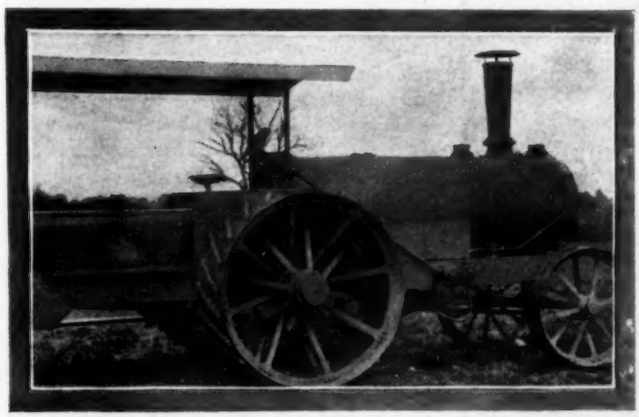
plicity itself, for much less exertion is required than in the case of operating a pleasure car.

Not the least interesting feature of construction is the manner in which a power unit can be removed and replaced by a stand-by set, the whole job being easily effected inside half an hour. The illustrations will show how neat and compact is the general design of the bus, which weighs, complete and ready for running, only 3 tons 8 cwt.

With regard to the new agricultural tractors, these are made in two types—the 100-horsepower, and 30-horsepower. The former is intended for use in such places as Canada, Russia and Argentina, where long plowing runs are required. A 21-disc plow, going down to a depth of 9 inches, can easily be hauled by this big tractor and in addition, the usual range of portable and stationary machine work, in addition to road haulage, is provided for.

How the Plan Is Worked Out

The engine is a 100-horsepower 6-cylinder Knight type, running on either gasoline or kerosene at the option of the buyer. Only magneto ignition is provided, on account of the many drawbacks of storage cells in new country; and for starting



How the 100-horsepower tractor looks

purposes a small "pup" engine, one cylinder, air-cooled, is fitted, driving the main shaft behind the flywheel and disconnected when out of use. The main engine is placed right at the rear of the machine, in an easily accessible position. The transmission comprises metal-to-metal clutch, two speed and reverse gearbox, and then worm drive of the countershaft. By this worm drive, using a steel worm and a phosphor bronze worm wheel, a large gearing reduction is easily obtained, with good efficiency. Final drive is by spur gears on the countershaft, which mesh with large gear rings on the main wheels. The total gear reduction is 114 to 1. Roller bearings are used throughout. The direct drive, for ploughing, gives a speed of 2.4 miles per hour, while the indirect hauling speed gives 4 miles per hour.

A large circular fuel tank forms the front of the machine, while behind the funnel comes the radiator. A fan impels air through the latter and, in addition, the engine exhaust is discharged through an injector nozzle up the chimney in such a way that a good air current is induced through the radiator tubes. The water consumption on full load is less than a gallon a day, while the fuel capacity is sufficient for a 12 hours run. The total weight is 11 tons and a draw bar pull of over 12,500 lbs. is given.

The 30-horsepower Daimler tractor has a 4-cylinder Knight engine of 4 inches bore, 5 1-8 stroke, giving its rated power at 1,000 revolutions per minute. In this case, the engine is placed in front beneath the bonnet, and, behind, comes the clutch, three speed gearbox and worm driven countershaft. The direct ploughing speed is 2 1-2 miles an hour; the other speeds give 4 and 7 miles respectively. A wagon body, of two tons capacity, is provided and a tipping gear operates this when required. This smaller tractor is intended for home use and also for countries like Australia, where comparatively small farms are the rule.

Concerning the road-trains, the third branch of Daimler activity, these were formerly known as the Renard. The Daimler road-trains are in use in Australia, India and elsewhere. California and British Columbia being exploited. The principle of the train is, of course, that the locomotor, in front, does not do any hauling, but just carries the motor which supplies power to a long flexibly-jointed shaft which runs the whole length of the train—usually four wagons or followers being employed. Each follower, by means of a worm-driven gearbox and final claim transmission, drives itself. Each follower is steered by the movement of the vehicle in front. All that the driver has to do is to steer his "loco" in the touring car way, and then, as each wagon reaches the place where the "loco" has left the straight line, it will begin to turn, and then pass on the movement to the next follower. A train of five vehicles can thus be steered over a plank ridge or along a chalk line, without any trouble. This means, of course, that the driver can easily avoid all the bad places on the road. Each wagon can carry 6 to 8 tons and as this load is divided over the six wheels, the maximum axle load is comparatively small. The motor used, it may be noted, is an 80-horsepower 6-cylinder Knight of 4 7-8 by 5 1-8 inches.

Wisconsin State Fair Meet Abandoned

MILWAUKEE, WIS., July 10—In line with the general movement to stop racing on mile horse tracks in the United States, the Wisconsin State Board of Agriculture has decided to abandon the idea of holding a race meet on the last day of the Wisconsin State fair in Milwaukee on Sept. 16. It is probable that the Board of Agriculture will not again sanction racing meets on the track. The idea of holding a motor show in conjunction with the State fair will be carried out as originally planned.

Warner Mfg. Co. New Plant Finished

TOLEDO, O., July 10—The new plant of the Warner Mfg. Co. here, is nearing completion and the company will have occupancy about July 15. This will more than double their present capacity in sliding gear transmissions, steering gears, differential gears and control sets.

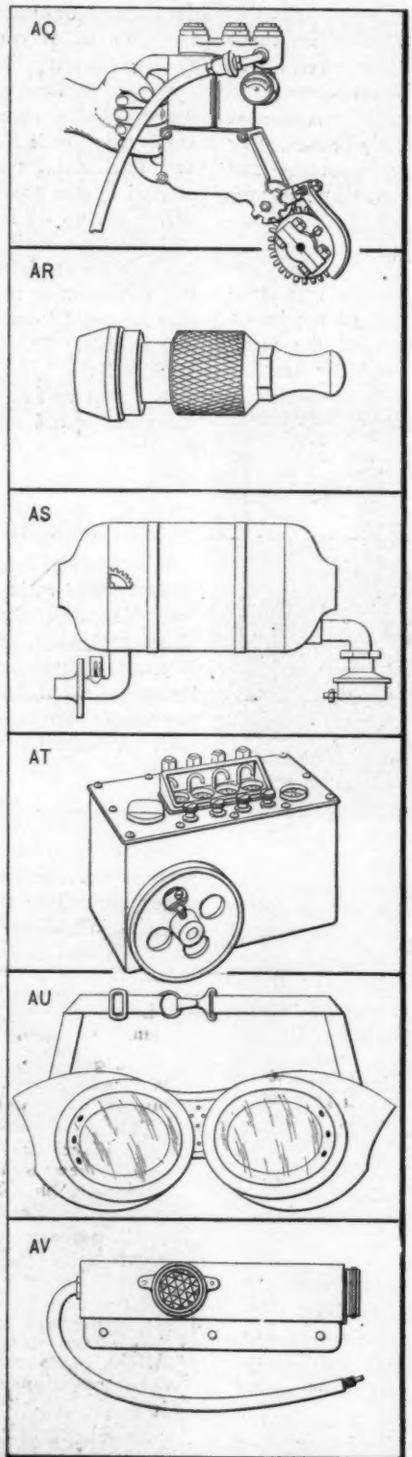
Example of 30-horsepower tractor

Seen in the Show Window

AMONG power pumps used for inflating automobile tires the Rector tire inflator (AQ) is to be mentioned. It consists of a small pump, the plunger of which is reciprocated in its cylinders, utilizing for this purpose the power of the engine of the car itself. The manner of operation is clearly seen in the illustration, in that the pump is actuated by a split gear drive, one pinion being permanently attached to a halftime shaft of the engine, *i. e.*, pump or magneto shaft, while the other is integral with the air pump and if held against its mate on the halftime shaft, serves to impart reciprocating motion to the plunger of the inflator. The pump is made by the Rector Engineering Company, Metropolitan Building, New York.

ACETYLENE, in most cases, is bought and transporated in tanks under a pressure which sometimes reaches two hundred pounds. Naturally, as the supply is drawn upon, this gas pressure falls off, and it would be fair to expect that as the original pressure of the gas current is diminished, the flow and consequently the height and illuminating power of the flame fall off too. On the other hand, the pressure while the tank is full, or nearly so, is much higher than would be necessary to produce a flame of proper height and strength. To solve the problem of furnishing an unaltered amount of acetylene under the same pressure at all times, a regulating device has been placed on the market. This is the Simplex gas regulating valve (AR) made by the Champion Igniter Company, 585 Boylston street, Boston, Mass. The adjustment of the regulator is accomplished by turning the revolvable piece of the device to one side or the other, thereby opening or closing an orifice to a varying degree, automatic regulation being a further consequence of this operation.

VAPORIZING the less volatile constituents of engine fuel is a complicated task, but in the construction of the Universal hydrocarbon gas producer its makers claim to have made a step toward the final solution of the problem. The device mentioned (AS) is 5 inches in diameter, its length varying in proportion to the power of the engine to which it is applied. In the producer the fuel is first atomized, and then drawn by engine suction through pipes heated by the exhaust gases, so that a complete vaporization of the liquid parts is effected. A very high fuel efficiency is claimed for the device by the Universal Oil Converter Company, 227 Borden avenue, Long Island City, N. Y.



AQ—Rector Tire Inflator is driven by the engine
AR—Simplex Regulating Valve for acetylene lighting systems
AS—The Universal Producer for vaporizing hydrocarbons
AT—Detroit Mechanical Oiler, an up-to-date force-feed system
AU—Covei rubber goggles protect and ventilate the eyes
AV—Adlake lamp for illuminating rear license number

WELL-LUBRICATED cylinders represent a desirable condition in an engine, and since the safest way of gaining one's end is by applying force, this principle has proved to work out well in the case of gasoline engines, where force-feed systems were used to introduce into the cylinders the oil necessary to insure smooth running. One of the well-known mechanical systems is here shown, this being the Detroit oiler (AT). Like most force-feed systems it is worked in connection with a circulating pump, the oil from the reservoir being forced through the mechanical oiler box seen in the illustration, whence it flows through individual leads to cylinders and bearings supplying all of them with the proper amount of lubricant. The type of oiler here shown, in several sizes to fit the various sizes of engines, is sold by the makers, the Detroit Lubricator Company, Detroit, Mich.

EYES, like eyeglasses and telescopes, are valuable instruments and deserve to be cared for and protected against dust and rough mechanical influences in at least the same measure as the artificial devices named above. At the same time the use of eyes cannot be dispensed with and the protecting case must be so made as not to interfere with the sight of the owner of the eyes. Another point to be carried in mind is that to be in proper working condition the human eye requires a certain amount of ventilation, all of which must be considered in the construction of good automobile goggles. The Cover rubber goggles (AU) are made of soft rubber and perfectly transparent material so as not to handicap the correct functioning of the eye in any way; the breathing feature is also incorporated in this device by means of air holes placed in the rubber in advantageous locations. These goggles are handled by Sussfeld, Lorsch & Company, 37 Maiden Lane, New York.

CONFORMING with the laws in most States, the automobilist is required to illuminate at night the number on his rear tag, and for this purpose the Adlake license number illuminator shown at (AV) it well adapted. It consists of a full-length reflector, sliding bottom glass and red jewel. One end shows white light, while the other serves to house the electric connection. Heavy brass is the material used in the manufacture of this lamp, and it may be of interest to know that any desired finish is supplied by the makers, the Adams & Westlake Company, of 319 West Ontario street, Chicago, Ill.